



Networks

The Corvus Service Manual



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**CORVUS SYSTEMS
NETWORKS
SERVICE MANUAL**

**COVERING
OMNINET DISK SERVER
UTILITY SERVER
CORVUS MULTIPLEXER**

PART NO.: 7100-04700
PUBLICATION NO.: NET/20-01/1.1
RELEASE DATE: NOV. 15, 1983

This document contains three types of notations. These are, in increasing order of importance, **NOTE**, **CAUTION**, and **WARNING**. The **NOTE** indicates some action to be taken to speed or simplify a procedure. The **CAUTION** indicates that potential damage to the equipment or user data exists, and care should be taken to avoid this. The **WARNING** indicates that potential harm or injury to the service technician or operator exists, and extreme care should be taken to avoid these.

CORVUS DEALER SERVICE

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Figures and Tables	vi
Specifications	vii

CHAPTER 1 — GENERAL DESCRIPTION

1.1	Scope of Chapter	1
1.2	Introduction	1
1.3	Product Identification	1
1.4	OMNINET	1
1.5	Utility Server	3
1.6	Corvus Multiplexer	3
1.7	Receiving Network Hardware	4
1.8	Setting the AC Voltage for the Disk Server and Multiplexer	4
1.9	Utility Server Voltage	5

CHAPTER 2 — OMNINET INSTALLATION

2.1	Scope of Chapter	6
2.2	Introduction	6
2.3	Trunk Line	6
2.4	Tap Boxes	7
2.4.1	Simple Tap Box	7
2.4.2	Terminator Tap Box	7
2.4.3	Active Junction Box	8
2.5	Receiving the OMNINET	9
2.6	Installing the Disk Server	10
2.6.1	Setting the DIP Switches	10
2.6.2	Connecting the Cables	13
2.7	Power-On Sequence	13

CHAPTER 3 — OMNINET FUNCTIONAL DESCRIPTION

3.1	Scope of Chapter	14
3.2	Introduction	14
3.3	Transporter Hardware	14
3.3.1	OMNINET Chip Set	14
3.3.1.1	MC6801 Microprocessor Chip	14
3.3.1.2	MC68A54 ADLC Communication Controller	14
3.3.1.3	Corvus Monochip	14
3.3.2	RS-422 Transceivers	15
3.3.3	Data Bus 7-0	15
3.3.4	Address Bus 15-0	15
3.3.5	Key Components and Signals	15
3.3.5.1	DMA Control Lines	15
3.3.5.2	Command Control Lines	15
3.4	Command Mechanism	15
3.4.1	Transporter Commands	16
3.4.2	Return Codes	16

CORVUS DEALER SERVICE

3.5	Hardware Interface	17
3.5.1	Address Lines	17
3.5.2	Data Lines	17
3.5.3	DMA Control	17
3.5.4	Command Control	17
3.5.5	Interrupt	17
3.6	Buffered and Unbuffered Transporters	17
3.6.1	Data Lines	18
3.6.2	Buffer Control	18
3.6.3	Interrupt	18
3.7	Line Acquisition	18
3.8	Packet Transmission	18
3.9	Packet Reception	18
3.9.1	No Socket	18
3.9.2	No Buffer	19
3.9.3	User Data	19
3.9.4	User Control	19
3.9.5	CRC Error	19
3.10	Packet Retransmission	19
3.11	Duplicate Message Packet Avoidance	19
3.12	Line Protocol	20
3.12.1	Leading Flags	20
3.12.2	CRC	20
3.12.3	Trailing Flags	20
3.12.4	Packet Information	20
3.12.4.1	Message Header	21
3.12.4.2	User Message	21
3.12.5	Acknowledgement Packet Format	22
3.12.6	Sync Packet Format	22
3.12.7	Echo Packet Format	23
3.13	Software	23

CHAPTER 4 — OMNINET TROUBLESHOOTING

4.1	Scope of Chapter	24
4.2	Introduction	24
4.3	Power Supply	24
4.4	Troubleshooting	26
4.4.1	Disk Drive Troubleshooting	26
4.4.2	Disk Server Troubleshooting	26
4.4.3	Trunk Line Troubleshooting	26
4.5	OMNINET Diagnostics	27
4.6	Preparation for Running the Diagnostics	27
4.7	OMNINET Test Functions	28
4.7.1	Receive Set	28
4.7.2	Receive End	28
4.7.3	Send	28
4.7.4	Send End	29
4.7.5	Show Counters	29
4.7.6	Zero	29
4.7.7	Who	29
4.7.8	Exit	29

CORVUS DEALER SERVICE

4.8	Additonal Terminology	29
4.9	Running OMNINET Diagnostics	30
4.10	OMNINET and Modified Apple II's	31

CHAPTER 5 — UTILITY SERVER INSTALLATION

5.1	Scope of Chapter	32
5.2	Introduction	32
5.3	Hardware Installation	32
5.3.1	Network Tap	32
5.3.2	Network Address	33
5.3.3	Cable Connections	33
5.4	Firmware	34
5.5	Port Configuration	34
5.6	Printing	35

CHAPTER 6 — UTILITY SERVER FUNCTIONAL DESCRIPTION

6.1	Scope of Chapter	36
6.2	Introduction	36
6.3	Transporter	36
6.4	Processor Section	36
6.4.1	Boot ROM	36
6.4.2	Z-80 Microprocessor	36
6.4.3	64K X 1 Bit Dynamic RAM	36
6.4.4	MC6883/74LS783	36
6.4.5	Key Signals	36
6.5	I/O Section	37
6.5.1	RS-232C Serial Port	37
6.5.2	Parallel Interface Port	37
6.5.3	Z-80 DART	38
6.5.4	Counter/Timer Circuit	38
6.5.5	Key Signals	38
6.6	Power Supply	39

CHAPTER 7 — UTILITY SERVER TROUBLESHOOTING

7.1	Scope of Chapter	40
7.2	Introduction	40
7.3	Server Test	40
7.4	Power Supply	41
7.5	Replacing the Fuse	43

CHAPTER 8 — MULTIPLEXER INSTALLATION

8.1	Scope of Chapter	44
8.2	Introduction	44
8.3	Receiving the Multiplexer	44
8.4	Multiplexer Jumpers	45
8.5	Multiplexer Table	45
8.6	Installation of the Multiplexer	46
8.7	Polling Parameters	47

CHAPTER 9 — MULTIPLEXER FUNCTIONAL DESCRIPTION

9.1	Scope of Chapter	49
9.2	Introduction	49
9.3	Address and Function Decoders	49
9.4	Port Selector	49
9.5	Multiplexers and Demultiplexers	49
9.6	Bus Drivers	50
9.7	Network Management Software	50
9.7.1	Volume Manager	50
9.7.2	User Manager	50
9.7.3	Constellation Manager	50
9.7.4	Boot Manager	50
9.8	Boot Software	50
9.9	Pipes and Semaphores	50
9.9.1	Pipes	50
9.9.2	Semaphores	50

CHAPTER 10 — MULTIPLEXER TROUBLESHOOTING

10.1	Scope of Chapter	51
10.2	Introduction	51
10.3	Drive Switches	51
10.4	Flat Cable	51
10.5	Multiplexer Table	51
10.6	Polling Parameters	51
10.7	Multiplexer PCA	51
10.7.1	Metal Box	51
10.7.2	Foam Box	53
10.7.3	Multiplexers with No Power Supply	53
10.8	Disk Drive	53
10.9	Removal of Network Devices	53

APPENDIX A — GLOSSARY	55
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APPENDIX B — OMNINET DRAWINGS AND SCHEMATICS

Disk Server Final Assembly — Foam Cabinet Parts List	57
Disk Server Final Assembly — Foam Cabinet	58
Disk Server Final Assembly — Metal Cabinet Parts List	59
Disk Server Final Assembly — Metal Cabinet	60
Disk Server PCA Assembly	61
Disk Server Schematics	62
Active Junction Box Top Assembly	64
Active Junction Box PCA Assembly	65
Active Junction Box Schematics	66

CORVUS DEALER SERVICE

APPENDIX C — UTILITY SERVER DRAWINGS AND SCHEMATICS

Utility Server Final Assembly — Wire Hook-Up Charts and Parts List	67
Utility Server Final Assembly	68
Power Supply Wire Hook-Up Charts and Parts List	69
Power Supply Assembly	70
Rear Panel Assembly Parts List	71
Rear Panel Assembly	72
Utility Server PCA Assembly	73
Utility Server Schematics — I/O Section	74
Utility Server Schematics — Transporter Section	75
Utility Server Schematics — Processor Section	76

APPENDIX D — MULTIPLEXER DRAWINGS AND SCHEMATICS

Multiplexer Final Assembly — Plastic Box Jumpers, Switch Hook-Ups, and Parts List	77
Multiplexer Final Assembly — Plastic Box	78
Multiplexer Final Assembly — Metal Box Parts List	79
Multiplexer Final Assembly — Metal Box	80
Multiplexer PCA Assembly	81
Multiplexer Schematics	82

APPENDIX E — UTILITY SERVER HARDWARE EQUATES

LIST OF FIGURES AND TABLES

LIST OF FIGURES AND TABLES

Figure

1-1	The Utility Server	viii
1-2	OMNINET Network	2
1-3	Multiplexer Network	3
1-4	CORCOM Unit	4
2-1	Trunk Line	6
2-2	Simple Tap Box	7
2-3	Terminator Tap Box	8
2-4	Active Junction Box	9
2-5	OMNINET Components	10
2-6	DIP Switch Location	11
2-7	OMNINET Cable Connections	13
3-1	Message Packet Format	20
3-2	Message Header	21
3-3	Acknowledgement Packet Format	22
3-4	Sync Packet Format	22
3-5	Echo Packet Format	23
4-1	Power Supply Test and Adjustment Points	24
4-2	OMNINET PCA	25
4-3	Transporter DIP Switches	26
5-1	Utility Server Installation Package	32
5-2	Utility Server Circuit Board and Switch Unit	33
5-3	Utility Server Rear View	34
6-1	Utility Server PCA	39
7-1	Printed Circuit Assembly and Power Supply	42
7-2	Fuse Replacement	43
8-1	Multiplexer Installation Package	44
8-2	Disk Drive Front Bezel	46
8-3	Multiplexer Cable Installation	47
10-1	Multiplexer PCA and Power Supply	52
10-2	Multiplexer PCA	54

Table

2-1	Device Address Settings	12
8-1	Early Revision Board Jumpers	45
8-2	Late Revision Board Jumpers	45
8-3	Multiplexer Table	45
8-4	Polling Parameters	48
9-1	Function Truth Table	49

CORVUS DEALER SERVICE

SPECIFICATIONS

SPECIFICATIONS

Physical Dimensions — Foam Cabinet (inches/centimeters)

Height	3.25/8.3
Width	7.75/19.7
Length	13.75/34.7
Weight (lbs/kg)	
Disk Server	4.7/2.12
Utility Server	4.8/2.18
Multiplexer	4.7/2.12

Environment

Temperature (F/C)	
Operating	50 to 120/10 to 50
Storage	-40 to 140/-40 to 60
Relative Humidity (non-condensing)	
Operating	20% to 80%
Storage	10% to 90%
Operating Altitude (feet/meters)	-1000 to 10,000/-305 to 3,050

AC Power Supply Requirements

Multiplexer and Disk Server	
Voltage (VAC)	100-120 or 200-240
Frequency (hertz)	47 to 63
Utility Server	
Voltage (VAC)	100, 110, 220, or 240
Frequency (hertz)	47 to 63
Overvoltage Trip Point (VDC)	6.2 ± 0.4
MTBF (hours)	10,000
MTTR (hours)	0.5

CHAPTER 1 GENERAL DESCRIPTION

1.1 Scope of Chapter

This chapter provides a brief description of the OMNINET Disk Server, Utility Server, and the Corvus Multiplexer. Receiving and installation procedures which are common to all three are also included in this chapter.

1.2 Introduction

Networks permit multiple users access to a common data base and peripheral equipment. Networks also provide electronic mail capabilities. The OMNINET Disk Server, Utility Server, and Corvus Multiplexer are Corvus Systems' contribution to the networks market.

The Multiplexer and OMNINET can each support a network of 1 to 64 devices. Utilizing the Corvus Multiplexer or OMNINET with the Corvus Winchester disk drives, shared access of from five to eighty megabytes of memory is possible.

The Utility Server can support three peripheral devices such as printers, modems, etc., simultaneously.

The Multiplexer and OMNINET may be used together in one network. See the section 8.6. The Utility Server may be used only on an OMNINET network.

1.3 Product Identification

All Corvus products can be identified by the serial number on the rear panel. The first three digits of the serial number are the date code, with the first two digits signifying the week manufactured and the third digit, the year. The following one or two letter code is the product code. The last three digits are the serial number of the week's manufacture.

OMNINET Disk Server = N

Master Multiplexer = M

Host Multiplexer = HM

Utility Server = L

Multiplexers configured for use with LSI-11 microcomputers will have "/L" at the end of the serial number.

An example of a network product serial number is:

143-M011

The above code means that this Master Multiplexer was manufactured in the 14th week of 1983, the first week in April, and was the 11th unit made during that week.

1.4 OMNINET

OMNINET can link up to 64 devices on a linear network. An RS-422 twisted pair wire makes up the network trunk. Connections to the trunk, tap cables, are also made of twisted pair wire. This increases the ease of wiring and is well suited to distances up to 4000 feet (1220 meters) with Active Junction Boxes.

The OMNINET Disk Server permits a Corvus disk drive to communicate over the OMNINET network trunk. A Transporter allows a microcomputer to do the same.

The Transporter is an intelligent interface card which resides in the device. The Transporter utilizes a Motorola 6801 microprocessor, a custom gate array integrated circuit to control high speed Direct Memory Access (DMA) data transfers, and associated support components. The Transporter is built into the Corvus Concept; for other computers the Transporter card is purchased with the OMNINET option. It both conditions information to be sent on the network and selects information on the network line for the addressed device.

OMNINET devices, such as the Disk Server and Transporters, are connected to the OMNINET trunk by a network tap. A network tap consists of a tap box, which taps into the network trunk, and a tap cable which connects the tap box to the OMNINET device.

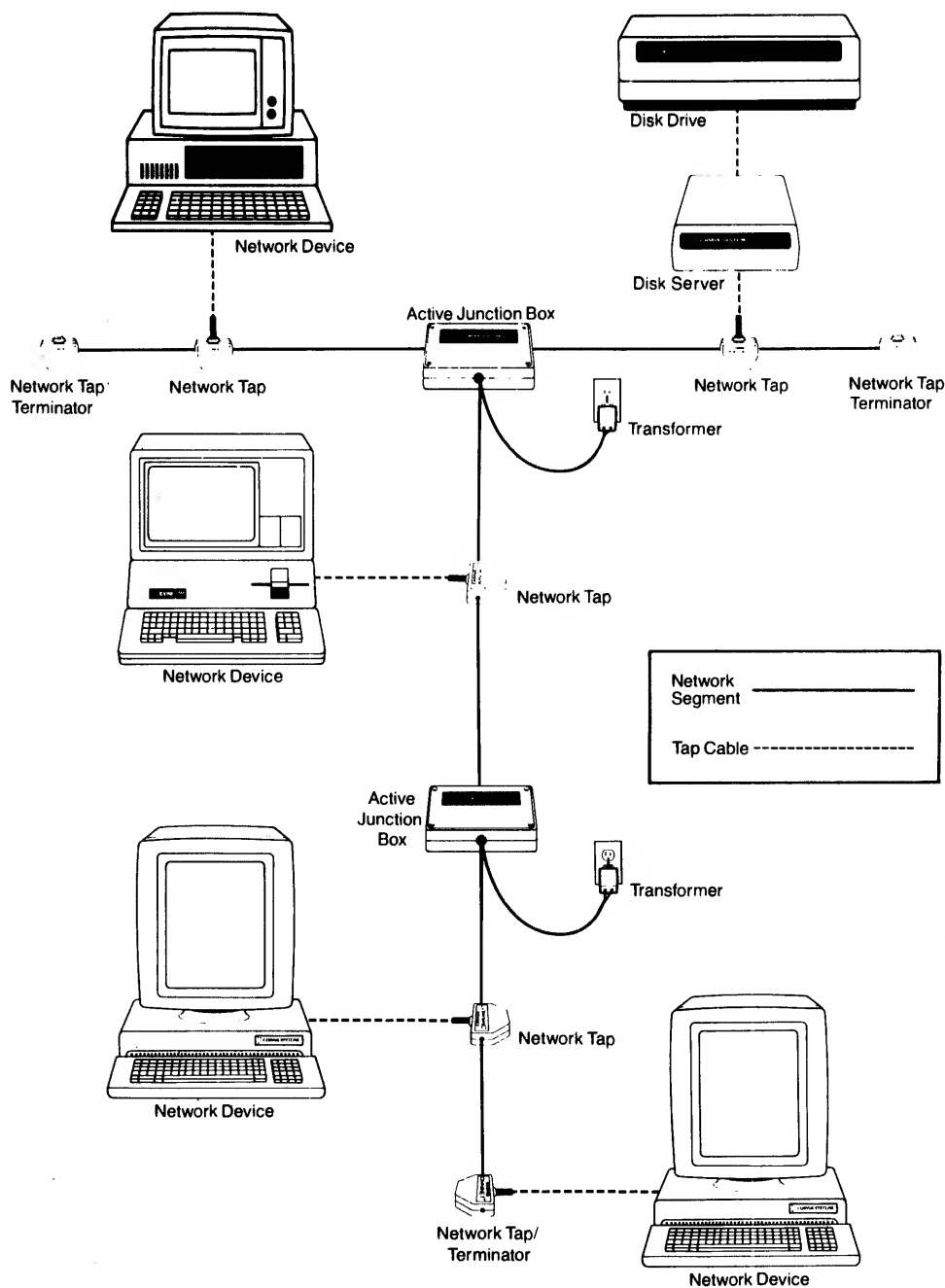


Figure 1-2. OMNINET Network

1.5 Utility Server

As the OMNINET Disk Server acts as the Transporter permitting Corvus disk drives to communicate over a network, the Utility Server acts as the transporter for network peripherals. The Utility Server consists of three major elements; transporter, I/O, and processor.

The Utility Server uses the same OMNINET tap cable for connection to the network trunk line. Connections to peripherals are made with flat cable or RS-232 Cable.

1.6 Corvus Multiplexer

The Corvus Multiplexer was first introduced in 1980. Designed for use with microcomputers, the Multiplexer can link up to 64 devices utilizing a simple star network.

A Multiplexer, used in conjunction with a Corvus disk drive, becomes the center of a "star." This central node contains hardware that polls up to eight devices in a round-robin fashion. These eight devices may be computers or "Host" Multiplexers. With eight Host Multiplexers, up to eight computers may then be connected to each host, thereby creating a two level network with a capacity of 64 devices.

Flat cable, 34-wire ribbon, links the network together. The maximum distance between a Master and a Host Multiplexer or between a Host Multiplexer and a computer is 50 feet (15 meters). In a two-level network this allows a total distance of 100 feet from the drive.

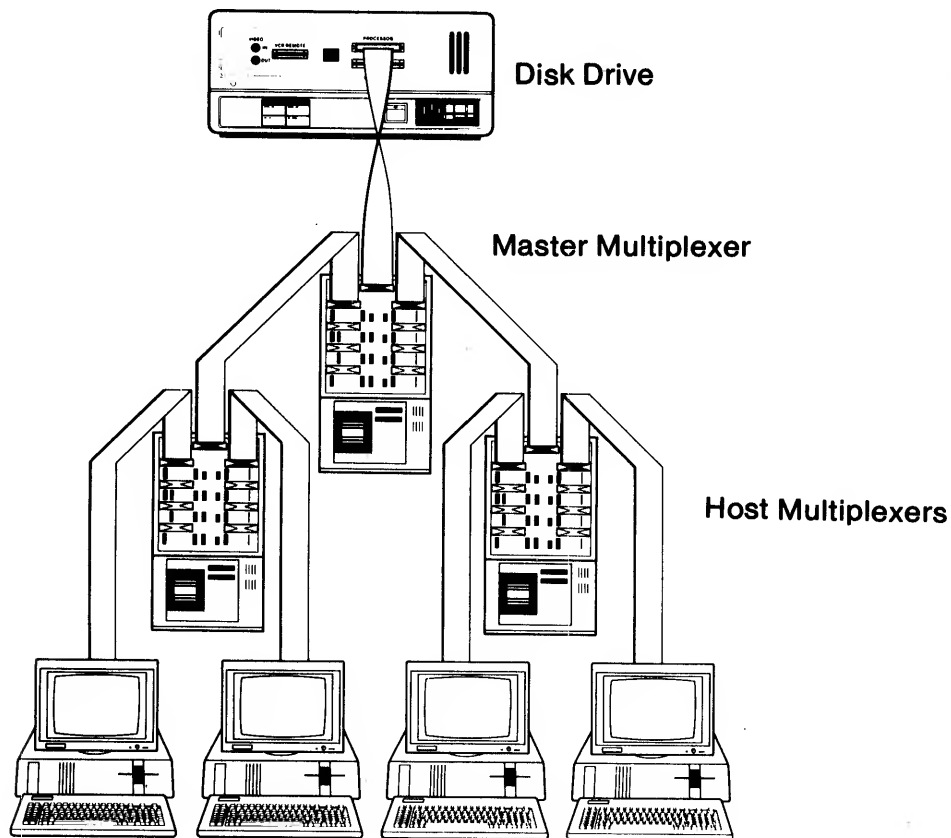


Figure 1-3. Multiplexer Network

1.7 Receiving Network Hardware

The OMNINET Disk Server, Utility Server, and Multiplexer should all be carefully unpacked and checked for shipping damage. External evidence of rough handling may be symptomatic of damage within the devices.

NOTE:

Any damage claims must be reported to the local office of the shipper so an inspection may be made, and a damage report filed. If the damaged equipment is a new product, the Corvus Order Processing Department must be contacted for proper return procedures. If the damaged equipment is a recently serviced product being returned under an RMA number (Return Merchandise Authorization number), contact the Corvus Customer Service Department for proper return procedures.

1.8 Setting the AC Voltage for the Disk Server and Multiplexer

Be sure the proper line voltage has been selected. To do this look at the bottom right corner on the back of the Multiplexer or Disk Server. There you will find the AC power cord connector and fuse receptacle. Directly underneath the fuse holder, the voltage setting is displayed. If you must change the voltage setting, proceed as follows:

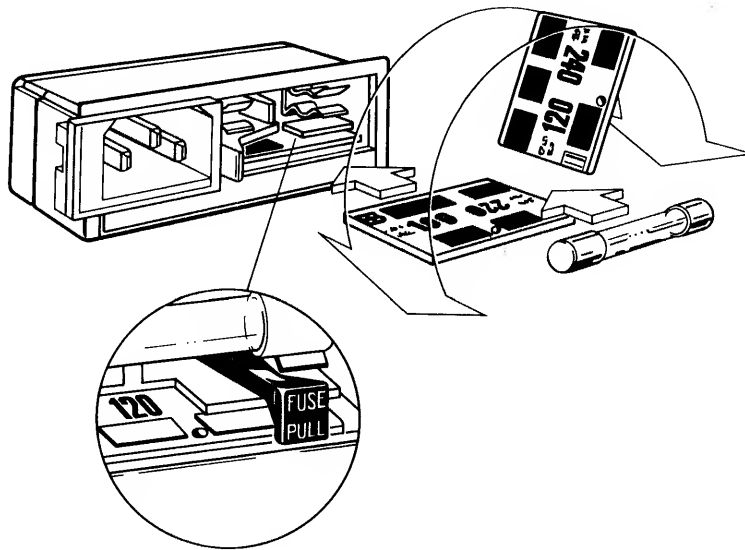


Figure 1-4. CORCOM UNIT

1. Remove the power cord from the CORCOM unit at the rear of the server or Multiplexer.
2. Slide the plastic door to the left, uncovering the fuse.
3. Remove the fuse.
4. Using a pair of needle-nose pliers, remove the voltage selection PCA from just below the fuse holder.
5. Position the voltage selection PCA so that the proper voltage is visible when the PCA is inserted.
6. Insert a new fuse. **DO NOT RE-INSERT** the fuse you have removed if the voltage setting has been changed. Proper fuses are:

110-120 VAC	½ Amp Slow Blow Fuse
220-240 VAC	¼ Amp Slow Blow Fuse
7. Slide the plastic door to the right.
8. Connect the power cord to the CORCOM unit and to the power outlet.

1.9 Utility Server Voltage

The Utility Server is manufactured for 100, 110, 220, or 240 volts AC. The voltage rating is written on the metallic label on the underneath side of the Server cabinet. If the voltage rating is not compatible with the local voltage, contact your Corvus dealer.

CHAPTER 2
OMNINET INSTALLATION

CHAPTER 2

OMNINET INSTALLATION

2.1 Scope of Chapter

Installation and operation procedures for the OMNINET are detailed in the OMNINET Installation Guide for each specific microcomputer. This chapter provides an overview of installation procedures.

2.2 Introduction

The Corvus OMNINET Disk Server is enclosed in a beige high-impact, foam-injection cabinet which contains the Disk Server Printed Circuit Assembly (PCA) and the power supply. The power supply, Model H/B5 manufactured by Power One Inc., operates from either 110-120 VAC or 220-240 VAC, 50 Hz or 60Hz single phase power. The OMNINET is connected to the disk drive by a 3-foot flat cable.

Unshielded twisted-pair wire (Beldon 8205, VWI 20 gauge for trunk and 22 gauge for tap cable) is used for the trunk line and all tap segments to the trunk line. Twisted pair wire must be used as the differential amplifier assumes that there is equal noise on each line. Connections to the trunk line are made utilizing network Tap Boxes. A Molex connector joins the tap line to the Transporter PCA, the network interface within the device.

The combination of a host computer or other network device, a transporter, and a tap cable form a "node." There may be as many as 64 nodes on the network, the OMNINET Disk server being just one of them.

2.3 Trunk Line

The layout of the network trunk should be planned keeping in mind these considerations:

1. The maximum trunk segment is 1000 feet (330 meters). When greater lengths are required Corvus Active Junction boxes must be installed at 1000 foot intervals to a maximum trunk length of 4000 feet (1220 meters).
2. The maximum distance between the trunk and the OMNINET device is 15 feet (4.5 meters). When this is not possible, a network 'Long Drop' may be utilized, however, this type of tap increases the trunk length.

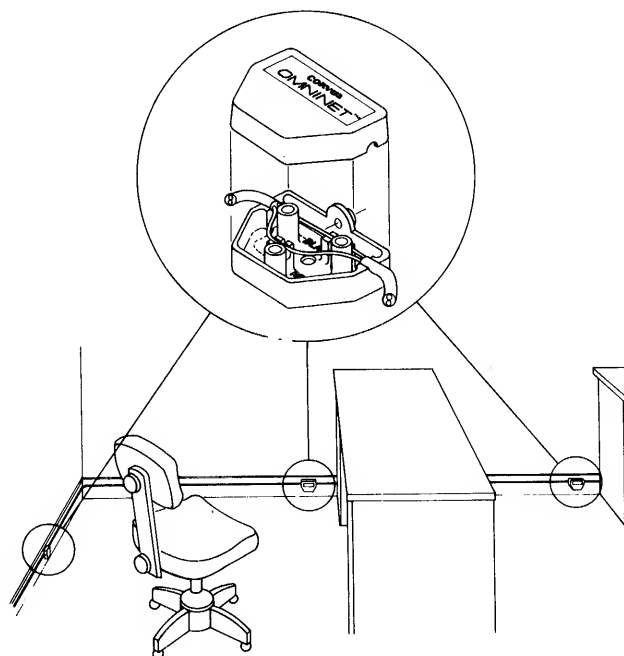


Figure 2-1. Trunk Line

Instructions for creating a trunk may be found in the Installation Guide for the specific microcomputer being used.

2.4 Tap Boxes

There are three types of Corvus Tap Boxes: Simple Tap Box, Terminator Tap Box, and the Active Junction Box. Complete installation instructions for each type of box may be found in the Installation Guide for the specific microcomputer being used, or in the Networks Workbook.

2.4.1 Simple Tap Box

A minimum distance of 5 feet (1.5 meters) between Tap Boxes on the trunk is recommended. To make a Simple Drop tap:

1. Using a knife or razor blade, remove about two inches of the trunk cable's insulating jacket, exposing the red and black twisted pair.
2. On the inside back of the Tap Box are two grooved plastic wire guides. Press the black signal wire into the plastic labeled BLACK.
3. Press the red signal wire into the plastic wire guide labeled RED.
4. Insuring that the trunk cable exits the Tap Box in the holes provided, line up the the top cover over the bottom and firmly squeeze the Tap Box Halves together.

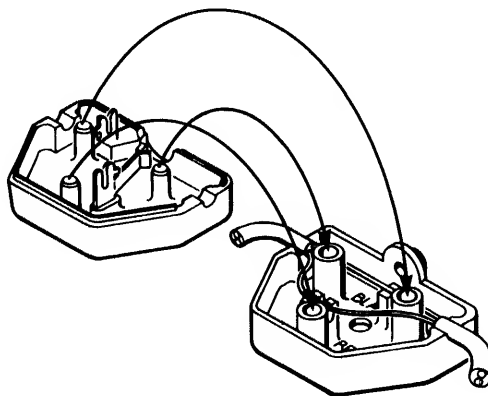


Figure 2-2. Simple Tap Box

2.4.2 Terminator Tap Box

The network trunk must be terminated at both ends. This is achieved by installing a 100 ohm, $\frac{1}{4}$ watt, $\pm 5\%$ resistor between the black wire and the red wire at each end of the network trunk. To make a Terminator Tap Box:

1. Cut the existing network trunk cable.
2. Using a knife or razor blade, remove about one inch of the trunk cable's insulating jacket, exposing the red and black twisted pair.
3. On the inside back of the Tap Box are two grooved plastic wire guides. Press the black signal wire into the plastic labeled BLACK.
4. Press the red signal wire into the plastic wire guide labeled RED.
5. Firmly seat the wire leads of the 100 ohm resistor into the grooves provided on the side of each metal connector.

6. Insuring that the trunk cable exits the Tap Box in the hole provided, line up the top cover over the bottom and firmly squeeze the Tap Box halves together.

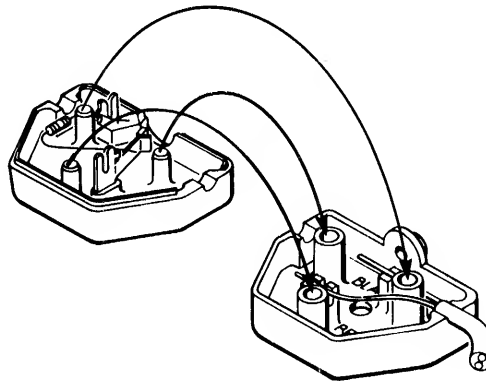


Figure 2-3. Terminator Tap Box

The Terminator Tap Box may also be used to form a node, although it is not recommended when troubleshooting a network.

2.4.3 Active Junction Box

An Active Junction Box is used to achieve a network length of up to 4000 feet (1220 meters). One must be installed for every 1000 feet (330 meters) of network trunk cable from the Disk Server. Active Junction Boxes are also required when a 'T' extension is made on the trunk line. Any such extensions must be terminated.

Installation procedures for an Active Junction Box are:

1. Cut the network trunk cable.
2. Strip the ends of the wires from both segments of the trunk to be connected to the Active Junction Box.
3. Put the red wire from one segment into the left-most tighten down screw marked "+" and its corresponding black wire into the "-" screw right beside it.
4. Put the red wire from the other segment into the right-most tighten down screw marked "+" and its corresponding black wire into the "-" screw right beside it.
5. If the trunk segment wires are shielded, although unshielded wire is recommended, connect the shield to the screw labeled "DRAIN."
6. Next connect the transformer: cut a length of network trunk cable and strip both wires at both ends.
7. Paying close attention to polarity, connect the power cable to the transformer. Put the red wire from this power cable into the tighten down screw marked "+" at the bottom edge of the Active Junction Box printed circuit board.
8. Put the black wire from this power cable into the tighten down screw marked "-" at the bottom edge of the Active Junction Box printed circuit board.

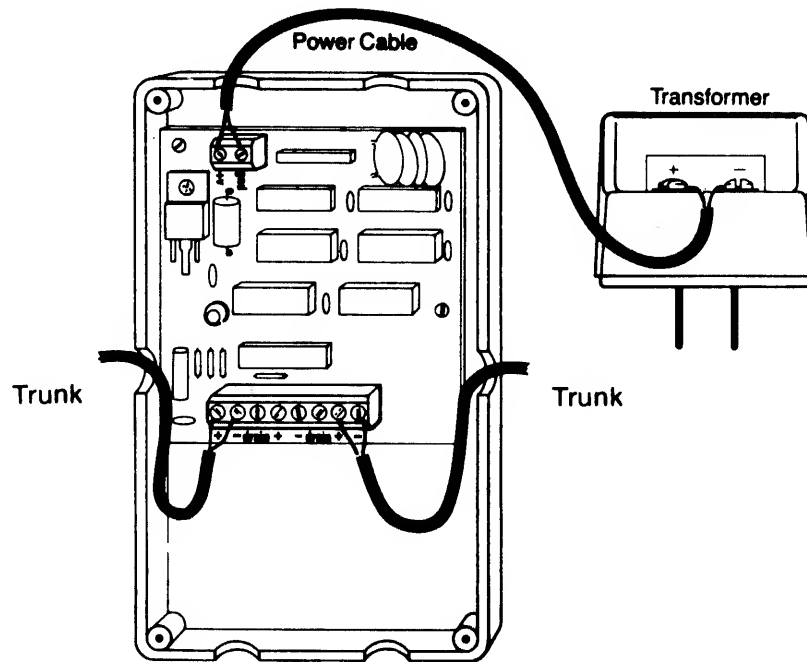


Figure 2-4. Active Junction Box

9. Connect the other end of the red wire to the screw marked "+" on the transformer.
10. Connect the other end of the black wire to the screw marked "-" on the transformer.
11. Check the power connection by plugging the Active Junction box to a 120 volt, 60 Hz wall outlet. The LED on the Active Junction PCB should light immediately.

2.5 Receiving the Disk Server

The OMNINET installation package contains the following items:

1. An OMNINET Disk Server with power cord,
2. A three foot (~1 meter) flat ribbon cable,
3. 1 tap cable,
4. 3 Tap Boxes,
5. 2 termination resistors, and
6. A installation manual.

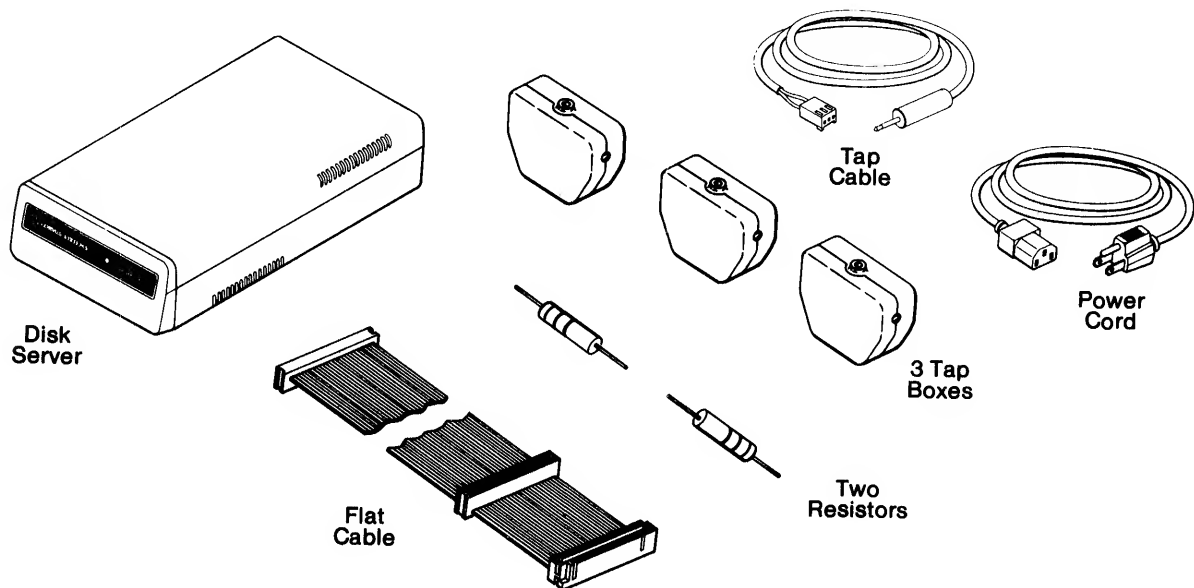


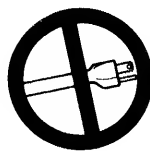
Figure 2-5. OMNINET Components

The Transporter option package contains the following items:

1. A Transporter card,
2. 1 tap Cable,
3. 1 Tap Box, and
4. An Installation Manual.

Trunk line is purchased as an option in 1000 foot (~330 Meters) lengths.

2.6 Installing the Disk Server



CAUTION:

When installing or removing an interface card, the host device must be powered off.

2.6.1 Setting the DIP Switches

Each network device must have a unique "address." This is done by setting the eight microswitches, DIP switches on the OMNINET PCA and the Transporter PCA's.

To set the Disk Server address, open the unit by loosening the two screws located on the back panel that secure the top of the unit, then lift and slide the top cover off the base. On the Disk Server PCA is an 8-microswitch unit, DIP switches. Switches 1 through 6 are used to set the unique OMNINET address in binary representation. The Disk Server must be set to zero. To do this set switches 1 to 6 ON, the switch is pressed down to the ON side.

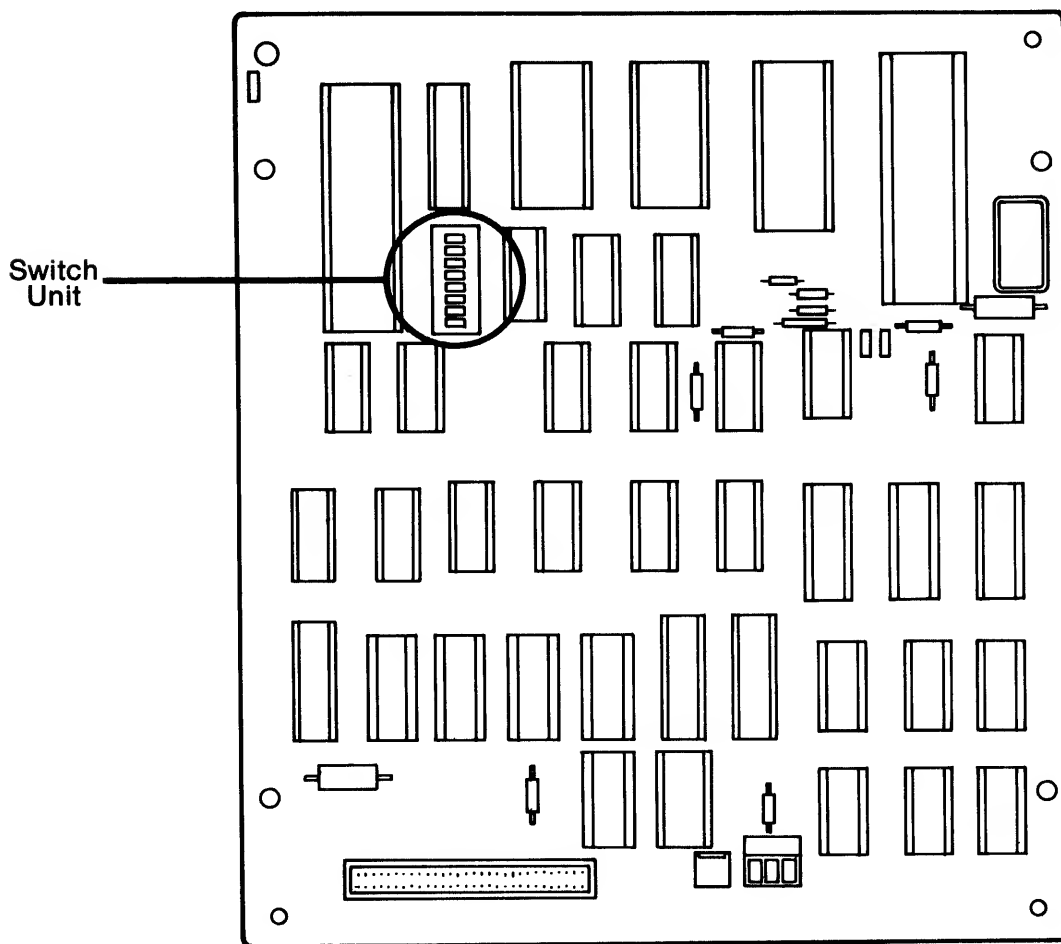


Figure 2-6. DIP Switch Location

DIP switch number 7 is used to set a bias offset on the OMNINET trunk cable. It is recommended that the Disk Server be used as the network bias device. Therefore, switch 7 should be on for the Disk Server and off for all other network devices. A network bias is used to reduce the effect of noise on the line when it is idle.

The other network devices may be set to any number other than zero. Switch settings for each of the possible 64 device addresses are shown in Table 2-1.

Address	Switch Setting					
	1	2	3	4	5	6
0	↑	↑	↑	↑	↑	↑
1	—	↑	↑	↑	↑	↑
2	↑	—	↑	↑	↑	↑
3	—	—	↑	↑	↑	↑
4	↑	↑	—	↑	↑	↑
5	—	↑	—	↑	↑	↑
6	↑	—	—	↑	↑	↑
7	—	—	—	↑	↑	↑
8	↑	↑	↑	—	↑	↑
9	—	↑	↑	—	↑	↑
10	↑	—	↑	—	↑	↑
11	—	—	↑	—	↑	↑
12	↑	↑	—	—	↑	↑
13	—	↑	—	—	↑	↑
14	↑	—	—	—	↑	↑
15	—	—	—	—	↑	↑
16	↑	↑	↑	↑	—	↑
17	—	↑	↑	↑	—	↑
18	↑	—	↑	↑	—	↑
19	—	—	↑	↑	—	↑
20	↑	↑	—	↑	—	↑
21	—	↑	—	↑	—	↑
22	↑	—	—	↑	—	↑
23	—	—	—	↑	—	↑
24	↑	↑	↑	—	—	↑
25	—	↑	↑	—	—	↑
26	↑	—	↑	—	—	↑
27	—	—	↑	—	—	↑
28	↑	↑	—	—	—	↑
29	—	↑	—	—	—	↑
30	↑	—	—	—	—	↑
31	—	—	—	—	—	↑
Address	1	2	3	4	5	6
Switch Setting						
32	↑	↑	↑	↑	↑	—
33	—	↑	↑	↑	↑	—
34	↑	—	↑	↑	↑	—
35	—	—	↑	↑	↑	—
36	↑	↑	—	↑	↑	—
37	—	↑	—	↑	↑	—
38	↑	—	—	↑	↑	—
39	—	—	—	↑	↑	—
40	↑	↑	↑	—	↑	—
41	—	↑	↑	—	↑	—
42	↑	—	↑	—	↑	—
43	—	—	↑	—	↑	—
44	↑	↑	—	—	↑	—
45	—	↑	—	—	↑	—
46	↑	—	—	—	↑	—
47	—	—	—	—	↑	—
48	↑	↑	↑	↑	—	—
49	—	↑	↑	↑	—	—
50	↑	—	↑	↑	—	—
51	—	—	↑	↑	—	—
52	↑	↑	—	↑	—	—
53	—	↑	—	↑	—	—
54	↑	—	—	↑	—	—
55	—	—	—	↑	—	—
56	↑	↑	↑	—	—	—
57	—	↑	↑	—	—	—
58	↑	—	↑	—	—	—
59	—	—	↑	—	—	—
60	↑	↑	—	—	—	—
61	—	↑	—	—	—	—
62	↑	—	—	—	—	—
63	—	—	—	—	—	—
Address	1	2	3	4	5	6
Switch Setting						
↑ = on						
— = off						

Table 2-1. Device Address Settings

Switch 8 is not used and should be in the off position for all devices.

2.6.2 Connecting the Cable

Take one end of the three foot flat cable, and connect it to the flat cable connection of the Disk Server PCA. The colored stripe on the flat cable should be to the right when viewed from the back, closest to the three pronged Molex connector. The flat cable should be installed so that it exits toward the rear of the Disk Server unit. The other end of the flat ribbon is connected to the PROCESSOR Port of the disk drive with the colored stripe to the right as viewed from the back.

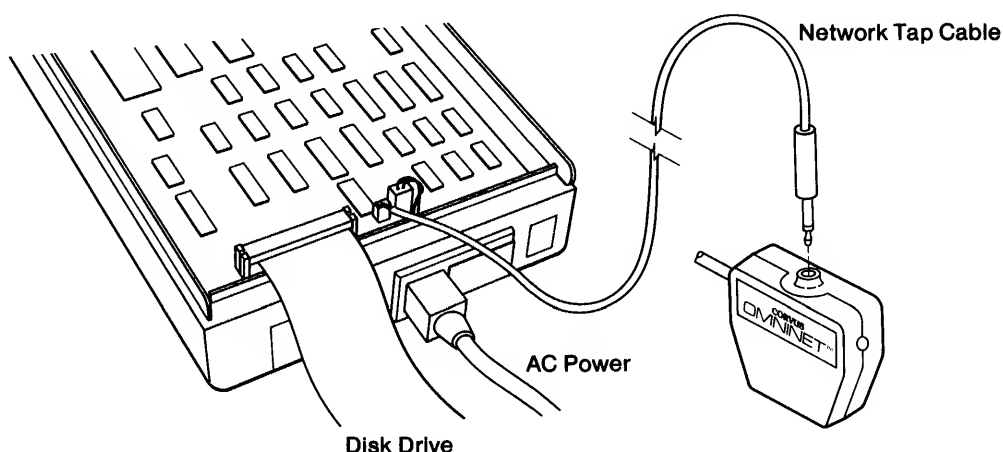


Figure 2-7 OMNINET Cable Connections

To connect the tap line to the Disk Server, locate the three pronged connector on the Disk Server PCA., The two tabs on the tap line connector slide over the single back tab of the PCA, and gently lock the tap cable in place.

2.7 Power-On Sequence

The OMNINET Disk Server must be powered up before the disk drive or any host device. If this is not done you must power-off and, again, power-on the server, and then the drive. Following this, computers may then be turned on or off at any time.

CHAPTER 3
OMNINET FUNCTIONAL DESCRIPTION

CHAPTER 3

OMNINET FUNCTIONAL DESCRIPTION

3.1 Scope of Chapter

This chapter provides an overview of the OMNINET operation. Transporter hardware and commands, and command formats are discussed. The hardware interface is described as are transmission packets and return codes.

3.2 Introduction

A host device issues a command to its Transporter by first formatting a command vector in memory and then sending the address of that vector to the Transporter. The Transporter interprets the command vector and executes the command. There are seven commands which are currently implemented on OMNINET, the two most common of which are the send message command and the setup receive command. Only one message may be sent at a time, but up to four messages may be received without intervention from the host. This is possible because four sockets can be activated by a unique setup receive command vector and as a result, operate completely independently. In addition, all messages for a socket are split into a User Data portion and a User Control portion and each is given its own host memory buffer region by the setup receive command for that socket. Thus, a message destined for a given socket can be routed by the host to any desired place in memory and the user data and control portions of the message can be sent to separate locations.

Additional information may be found in the OMNINET Programmer's Guide, and the User's Guide for the appropriate microcomputer.

3.3 Transporter Hardware

Every host device on the network, microcomputer, disk drive, or Utility Server must have a transporter. In the Corvus Concept, the OMNINET Transporter is built-in. The Disk Server acts as the Transporter for the disk drive. The Utility Server contains the Transporter for peripheral devices such as a printer.

3.3.1 OMNINET Chip Set

The main logic of every transporter is contained in three integrated circuits called the OMNINET chip set. This set consists of the:

- MC6801,
- MC68A54, and
- Corvus Monochip.

3.3.1.1 MC6801 Microprocessor Chip

The MC6801, U15, is an 8-bit single chip microcomputer unit that contains within it 2048 bytes of ROM and 128 bytes of RAM. The ROM contains the transporter operating code that begins executing at power-up. The RAM is used by the ROM code for storage of command vectors, system variables, and jump tables.

3.3.1.2 MC68A54 ADLC Communication Controller

The ADLC (Advanced Data Link Controller), chip U30, provides the interface between the RS-422 transceivers and the rest of the Transporter. The main functions of the ADLC during transmission operations are serialization, zero-insertions, packet framing, CRC generation, and data byte buffering. The ADLC performs these functions in reverse during a receive.

3.3.1.3 Corvus Monochip

The Corvus Monochip, chip U16, is a custom designed gate array which provides the timing and control for all data transfers that occur outside the 6801 microcomputer. Due to the slow speed of the serial data transfers of the ADLC compared to the 6801, the monochip must 'freeze' the 6801 and handle all bus synchronization during a DMA transfer.

3.3.2 RS-422 Transceivers

The transceivers, U5 and U6, are called the driver and receiver. These devices physically connect the OMNINET chip set to the network trunk line.

The driver, IC 75175, accepts data bits from the ADLC and converts them into voltage differentials onto the trunk line. The arrival of a zero bit from the ADLC causes the 75175 drive to generate a line transition.

The receiver, IC 75174, provides the inverse function of the driver. Line transitions are interpreted as data zeros; maintained voltage differentials are interpreted as data ones. These bits are sent serially to the ADLC.

3.3.3 Data Bus 7-0

The data bus is an 8-bit, bi-directional, tri-state bus over which message data, command vector addresses, and command information is sent to the transporter section. The transporter uses this bus to send command status and message data to the processor and I/O sections. The data bus is interfaced to the transporter section through a couple of latches, 74LS374 at U13 and U14.

3.3.4 Address Bus 15-0

The address bus is a 16-bit, tri-state bus. The low order 13 bits of the address are latched in the transporter section to be used for DMA transfers. Bits 15-13 of the DMA address are generated by the monochip from information given to it by the 6801. The address lines are interfaced to the transporter section through latches, 74LS374 at U22 and U23.

3.3.5 Key Components and Signals

The key components of the transporter section are installed in sockets. This facilitates troubleshooting procedures and future enhancements. The heart of the transporter is the OMNINET chip set and the RS-422 transceivers.

3.3.5.1 DMA Control lines

Three lines control DMA transfer to and from the processor section dynamic RAM. They are:

- DMAREQ This signal is used as a DMA request from the monochip. It is active high.
- DMAGQ The Z-80 grants the monochip direct memory access when the signal goes low.
- IN/OUT The transporter drives this line high or low depending on whether it is reading or writing.

3.3.5.2 Command Control Lines

A two line handshake controls the command vector address transfer. The signals are:

- READ This line signifies that the transporter is ready to receive a command vector address byte.
- STROBE On a low to high transition, the command vector address byte that is present on the data lines is latched into the CAR.

3.4 Command Mechanism

Host devices on the network initiate commands by sending a 24 bit address to the Transporter in the form of 3 bytes. At this address is the command vector which contains a command code, a result record address and other command dependent information.

Before issuing a command, the host must write the value FF hexadecimal to the first byte, called the status byte or return code, of the result record. When the command is completed, the Transporter will signal the host by altering the result record. On host computers that support interrupts, an interrupt will occur after the result record has been modified.

Command vector addresses are sent to the Transporter, one byte at a time, using a polling procedure to determine when the Transporter is ready to accept each byte. The status bit of interest is the Transporter READY line, which is an indication of the Transporter's ability to accept the next byte in the sequence, but does not reflect the Transporter's ability to accept the entire sequence immediately. If the Transporter is transferring a message to the host at the beginning of a command sequence, or starts to transfer a message to the host in the middle of a command sequence, the READY line will go low indicating the Transporter's unreadiness to accept the next byte of the command vector address. The READY line will remain low until the Transporter has finished writing its message into the host memory.

3.4.1 Transporter Commands

Every host device on the network, be it a computer, disk drive (a Disk Server is the Transporter for a drive), or a printer has its own Transporter to handle communication with other devices. All Transporters on the network perform exactly the same functions. There is no master network controller.

The commands supported by the Transporter are:

Initialize - Initialize Transporter. This automatically occurs at power on.

Send Message - Send a message to a specified node or broadcast a message.

Setup Receive - Prepare to receive a message.

End Receive - Stop receiving messages.

Who Am I - Return node (device address) ID number.

Echo - Check for the existence of a specified node. This command does not affect any state of the specified node.

Peek/Poke - Set the Transporter parameters (number of retries, etc.).

3.4.2 Return Codes

The values for the Return Codes which result from the various commands are:

00	Command was successfully completed.
00-3F	Node identification number.
01-7F	Transmit retry count.
80	Transmit failure. No acknowledgement after maximum number of retries.
81	Transmitted message User Data portion was too long for receiver's buffer.
82	Message was sent to an uninitialized socket.
83	Transmitted message User Control portion size did not equal receiver's control buffer size.
84	Bad socket number in command. Must be 80, 90, A0, or B0.
85	Receive socket in use; a valid buffer is attached.
86	Bad node number in command, must be 0-7F or FF.
C0	Received an ACK for an Echo command.
FE	Receive socket setup.

The unit of transfer, as seen from the host level, is a single message which is transmitted directly from the originating host to the receiving host. The Transporter creates a network packet from the host data by adding a certain amount of overhead information and converting the resultant packet into a synchronous serial bit stream, which "travels" along the network bus to all other nodes.

The Transporter to which the packet is directed (the addressing information is contained with the message packet) strips off the packet overhead, converts the serial data stream back to bytes, and transfers the message data to the receiving host. Note that transfer is direct from one host memory to the other via simultaneous DMA. Network collision avoidance, error detection, error recovery, and duplicate packet detection are all handled by Transporters in a manner which is completely transparent to the hosts.

A message consists of two portions, both of which are variable length and may be null. The portions are called the User Data portion and the User Control portion. Thus a message destined for a given socket can be routed by the host to any desired place in memory and the User Data and User Control portions of the message can be sent to separate buffers increasing system performance.

There are four sockets (80, 90, A0, and B0) which may be activated for receiving a message. Each socket will accept messages destined for that host and that socket number only.

3.5 Hardware Interface

All of the lines in the host-Transporter interface are TTL compatible and have the characteristics described below.

3.5.1 Address Lines

There are 24 address lines through which the Transporter selects which byte of host memory it is writing to or reading from during a DMA cycle. When the host computer is driving the address lines, no DMA cycle in progress, the Transporter ignores them.

3.5.2 Data Lines

There are 8 bi-directional data lines which are used for reading and writing data from and to the host memory.

3.5.3 DMA Control

Three lines are provided for control of DMA transfers to and from host memory:

DMA REQUEST line from the Transporter.

DMA GRANT line from the Transporter.

DMA DIRECTION line from the Transporter. The Transporter drives this line high or low depending on whether it is reading or writing.

3.5.4 Command Control

Command Control is implemented utilizing a two wire handshake. When the Transporter is ready to accept an address byte from the host it sets the READY line high. When the host is ready to send a byte to the Transporter it sets the READY line low and presents the data byte on the DATA lines. As soon as the host sets the STROBE line low, the Transporter sets the READY line low to insure that the second address byte is not sent before the first byte has been received. The address byte on the data lines is latched-in and the transfer is complete when the host brings the STROBE line high again. The host then waits for the READY line to go high before sending the next address byte.

After receiving the third byte of a command vector address, the Transporter sets the READY line high. It is not however, ready to receive the first byte of a new command vector address. The host must wait until the command just issued has completed to begin the issuance of a new command. Command completion is indicated through the return code and the interrupt mechanism.

3.5.5 Interrupt

A low going pulse on the interrupt line is generated by the Transporter whenever a command is either accepted or completed. The interrupt is intended to indicate to the host that it should check the return code.

3.6 Buffered and Unbuffered Transporters

In most cases, the transmission of a message by a Transporter requires that the data to be sent be retrieved out of host memory from the location pointed to in the Send Message command vector. By the same token the reception of a message usually requires that the Transporter write the data which it is receiving to the location in host memory specified in the Setup Receive command. Both of these operations take place through DMA but there are some microprocessors which may not be able to support DMA. It may be that it is impossible for the microprocessor to relinquish control of its memory address bus or that host memory is too slow to keep up with a continuous stream of direct memory accesses at the rate of incoming or outgoing messages. Whatever the reason, in these systems the normal DMA Transporter must be modified to accommodate the microprocessor. The Buffered transporter is the result.

The buffered Transporter simply adds a certain amount of fast access memory (RAM), usually 4k, to the DMA Transporter. The host is allowed access to this memory and places all message and command data in it. The Transporter, meanwhile, treats this memory as if it were host core memory and transfers data in and out of it utilizing normal DMA procedures. Host addressing of the buffer is performed via a counter which is automatically incremented after each byte is read or written.

The hardware interface lines to control a buffered Transporter, TTL compatible, are listed below.

3.6.1 Data Lines

There are 8 bi-directional data lines which are used for reading and writing data from and to the buffer memory.

3.6.2 Buffer Control

Five lines are provided for control of transfers to and from the buffer.

Read/Write lines determine data bus direction. Enable signal validates control line state. Two select lines control the buffer memory operation:

- set buffer address pointer
- read/write buffer memory
- read Transporter status
- write command vector address to transported

3.6.3 Interrupt

A low going pulse on the Interrupt line is generated by the Transporter whenever a command is either accepted or completed. The interrupt is intended to indicate to the host that it should check the return code.

3.7 Line Acquisition

When a Transporter has a packet to transmit, the line is checked for the idle state. If there are no line transitions during the check period (10 μ sec nominal), then the Transporter forces a transition on the line, the first zero of the first flag byte, and continues to transmit the packet.

If the Transporter cannot transmit either because the line is not idle or because another Transporter starts transmitting during the check period, the Transporter which is waiting to transmit calculates a random delay factor which, when multiplied by a scale factor, yields a delay count. This delay count is then decremented only during the line idle periods and when the count reaches zero the transporter attempts to acquire the line again. This process is repeated until either the Transporter acquires the line or the number of retries have exceeded an internal retry limit.

The random delay mechanism eliminates the problem of several Transporters all attempting to acquire the line at once as soon as it becomes available.

3.8 Packet Transmission

Once the transmitting Transporter has acquired the line, the packet is sent with no further attempt to detect collision with another Transporter. Nevertheless, no collision will occur as all other Transporters waiting to transmit will sense that the line is busy.

3.9 Packet Reception

The receiving Transporter makes a number of checks as the packet is received. If no errors are discovered, the Transporter accepts the packet, sends off an ACK packet to the sending Transporter, and DMA's the user portion of the received packet to its host.

If an error is discovered, the action taken depends upon the type of error.

3.9.1 No Socket

If there is no socket set up for the packet and there is no CRC error, the receiver waits for the packet to complete and then returns a negative acknowledgement packet to the transmitting Transporter; the NAK code will be 82 hex.

3.9.2 No Buffer

If there is no buffer set up to receive the incoming packet, i.e. the destination socket has just received a message and its data buffer is full, the receiver ignores the packet and takes no other action. By not sending any kind of acknowledgement packet to the transmitter, the receiver in effect asks that the packet be sent again. This gives the host time to clear the socket buffer for the receipt of the retransmission.

3.9.3 User Data

If the User Data portion of the message is too long for the buffer and there is no CRC error, the receiver waits for the packet to complete and then returns a NAK packet to the transmitting Transporter; the NAK code will be 81 hex.

3.9.4 User Control

If the User Control portion of the message is not exactly the same size as that expected by the receiving socket and there is no CRC error, the receiver waits for the packet to complete and then returns a NAK packet to the transmitting Transporter; the NAK code will be 83 hex.

3.9.5 CRC Error

If the packet generates a CRC error, possibly because of a collision, the receiver throws the packet away and takes no other action.

3.10 Packet Retransmission

Once the message packet has been sent, the transmitting Transporter waits for an ACK or NAK packet to be returned by the receiving Transporter. If no such packet is received within 50 μ sec., the transmitting Transporter makes an attempt to re-acquire the line and retransmit the message.

As soon as an ACK or NAK packet is received, the transaction is considered to have been completed and the host will be informed of the transaction status.

3.11 Duplicate Message Packet Avoidance

To guard against duplicate message packets being received (when an ACK is sent by the receiver, but not seen by the transmitter) there is a special avoidance logic which utilizes two packet header fields as well as long-term memory in both the transmitting and receiving Transporters.

The crucial fields in the packet header are the retry count field and the transaction parity field. The retry count is always zero on the first transmission attempt for any packet and is then incremented on each retry. The transaction parity is a single bit and basically alternates in value between zero and one for each new (non-retry) packet being transmitted.

Each Transporter contains a table of parity bits, one bit for each possible Transporter on the network (itself plus 63 others). During normal operation, taking two Transporters A and B as an example, the Ath bit in B's table and the Bth bit in A's table will be equal in value. This fact will be used in the manner explained below to prevent duplicate packets from being received.

The transmitting Transporter (A transmitting to B) will include the complement of the Bth bit of its table in all packets. If the packet is ACKed, the Transporter will then complement the Bth bit in the table; otherwise the Bth bit is left unmodified.

The receiving Transporter (B receiving from A) updates its Ath table entry from the PARITY bit in the packet whenever it ACKs a packet. The receiving Transporter also examines the parity bit in a packet whenever the retry count is unequal to zero; in that case, if the parity bit is equal to the Ath bit of its table, a duplicate has just been received (Transporter A missed the ACKS) and the receiver sends another ACK and throws the packet away.

Note that in an NAK situation neither the transmitting nor receiving Transporter updates its internal table, thus retaining mutual synchronization.

The duplicate avoidance scheme requires that all parity tables be synchronized prior to the beginning of message transfers. A synchronizing packet from transporter A tells all other Transporters in the network to set the Ath bit of their parity tables to zero. This packet is sent many times on initialization to assure synchronization. Initialization occurs on power-up and on hardware resets.

All active Transporters have the ability at any time during normal network operation, to receive synchronizing packets from Transporters being initialized. Transporters update their parity tables on the basis of the information they receive through synchronization packets but they do not respond with ACK packets.

3.12 Line Protocol

The Advanced Data Link Controller, ADLC, an MC6854 chip which communicates directly with the line drivers, ensures that all packets have a certain amount of control information in common. This information is generated by the transmitting ADLC and is interpreted and stripped by the receiving ADLC. A packet has the general format shown in figure 3-2.

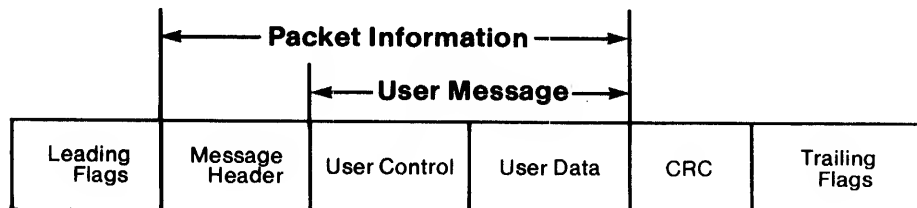


Figure 3-1. Message Packet Format

3.12.1 Leading Flags

The leading flag field contains a number of flag bytes which allow the receiving Transporter to synchronize its clock with the incoming data and obtain bit and byte alignment. A flag consists of the bit pattern 01111110. This pattern is unique because no zeros are inserted into the string of ones. Data bytes elsewhere in the packet are all subject to zero-insertion and so cannot be mistaken for flag bytes. The actual number of flags in the leading field is variable.

3.12.2 CRC

The CRC is a 16-bit Cyclic Redundancy Check which is generated by the transmitting ADLC, and validated by the receiving ADLC. This validation is just one of several error checks performed by the receiving Transporter.

3.12.3 Trailing Flags

Trailing Flags indicate the end of an incoming packet and allow the receiving Transporter to validate the data and to start sending the message acknowledgement. As before, a flag consists of the bit pattern 01111110. The number of flags in this field is variable.

3.12.4 Packet Information

The packet information includes the Message Header, user control, and the User Data portions.

3.12.4.1 Message Header

The Message Header field contains pack addressing and control information as shown in Figure 3-2. Divisions into bytes are marked with '+' signs. The abbreviations msb and lsb stand for most significant byte and least significant byte respectively.

Destination Address	
Source Address	
Validation = A5	
Destination Socket	
Retry Count	
Parity Field	
User Data Length	msb lsb
User Control Length	
Padding	

Figure 3-2. Message Header

Destination Address - The OMNINET node number of the intended receiver. 0-63 are legal node numbers, with a value of 255 (FF hex) indicating a 'broadcast' message. All Transporters receive messages addressed to destination 255 but none acknowledges such a message.

Source Address - The OMNINET node number of the message originator. 0-63 are legal node numbers.

Validation Byte - A constant A5 hexadecimal (165 decimal).

Destination Socket Number - The Transporter socket number within the receiver. Hexadecimal 80, 90, A0, or B0 are the legal values.

Retry Count - Contains the number of times this message has been retransmitted. In the very first transmission of a message, the value is zero.

Parity Field - Contains 00 or 01. This is the parity field used for duplicate packet detection discussed earlier.

User Data Length - The length, in 8-bit bytes, of the user data portion of the message. Possible values range from 0 to 1023.

User Control Length - The length, in 8-bit bytes, of the User Control portion of the message. Possible values range from 0 to 255.

Packet I.D. - A 16-bit number which uniquely identifies any message when used in conjunction with the source host number.

3.12.4.2 User Message

The user message can be up to 2302 bytes long, and consists of two portions, the User Control and User Data portions.

User Control Portion - 0 to 255 bytes as specified by the User Control length byte in the packet header. The data in this portion of the message are not examined by the Transporter.

User Data Portion - 0 to 2047 bytes as specified by the user data length bytes in the packet header. The data in this portion of the message are not examined by the Transporter.

3.12.5 Acknowledgement Packet Format

The acknowledgement packet is the vehicle by which a receiving Transporter sends a positive or negative acknowledgement to a transmitting Transporter after a message packet, or echo packet, has been received. If a message has been received without difficulty and without detectable errors, a positive acknowledgement (ACK) is sent. If errors were detected or if for some other reason the packet could not be received, a negative acknowledgement (NAK) is sent.

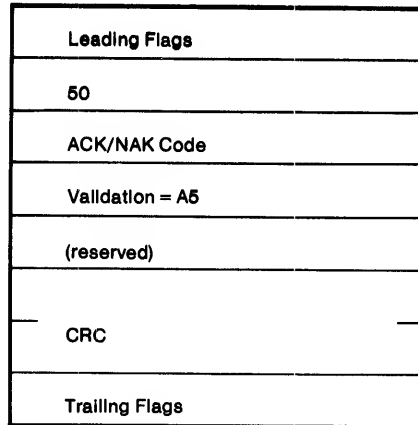


Figure 3-3. Acknowledgement Packet Format

Note that the acknowledgement packet contains no destination address yet is intended for only one host. This is possible because the acknowledgement packet is sent immediately after a message packet is received. No bus idle time is allowed between message and acknowledgement so there is no possibility that another Transporter could have sent a message and thus also be expecting an acknowledgement.

3.12.6 Sync Packet Format

The sync packet is the vehicle by which a Transporter makes its presence known to all of the other Transporters in the network. It has the effect of initializing all of the Transporters' transaction parity tables as explained earlier.

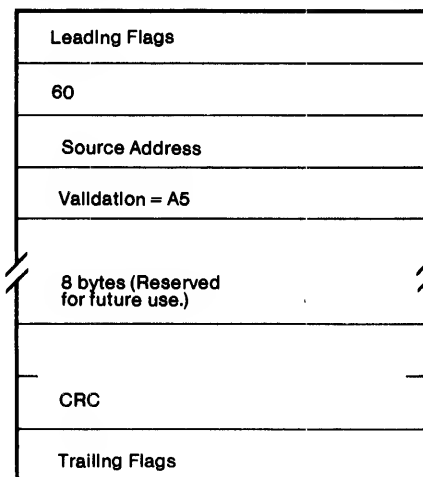


Figure 3-4. Sync Packet Format

3.12.7 Echo Packet Format

The echo packet is the vehicle by which one host may verify the presence of another node without disturbing the host attached to that node. If it is functioning properly, the receiving Transporter will acknowledge reception of the packet but will not inform its host that anything happened.

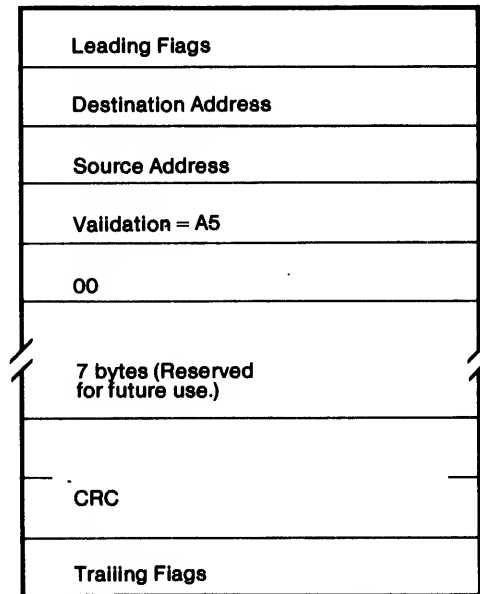


Figure 3-5. Echo Packet Format

3.13 Software

Network management software, Constellation, and other software utilities are discussed briefly in section 9.7 through 9.9.

CHAPTER 4
OMNINET TROUBLESHOOTING

CHAPTER 4

OMNINET TROUBLESHOOTING

4.1 Scope of Chapter

This chapter provides instructions for adjusting the OMNINET power supply. Preliminary network troubleshooting techniques are detailed in this chapter. Also described is the use of the OMNINET diagnostic program. All of the diagnostic functions are discussed. Associated terminology is defined.

4.2 Introduction

Troubleshooting an OMNINET network can require both hardware and software verification. Hardware troubleshooting serves to eliminate installation errors and faulty contacts. A diagnostics program provides test signals used to isolate problems. Used together, troubleshooting procedures and OMNINET Diagnostics will facilitate the identification of trouble areas.

4.3 Power Supply

Aging of the power supply and normal heating and cooling of the network electronics can cause the power supply voltage to drift over time. To measure and adjust the OMNINET power supply, follow the steps below.

WARNING:

Extreme caution should be exercised when adjusting the power supply. High voltages present a potential hazard.

1. Remove the two screws from the rear of the OMNINET cabinet which hold the cover.
2. Check the voltage across the two power supply terminals. The reading should be 5 volts ± 0.10 volt.
3. If the power supply is not within specifications, the power supply is adjusted by turning the "V. ADJ" resistor at R6.

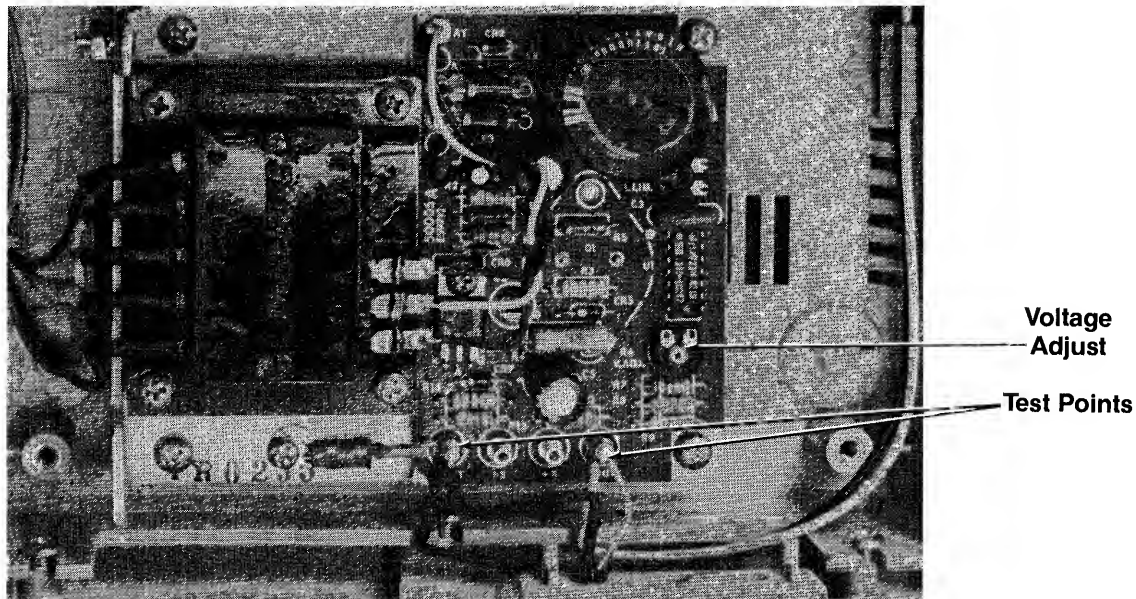
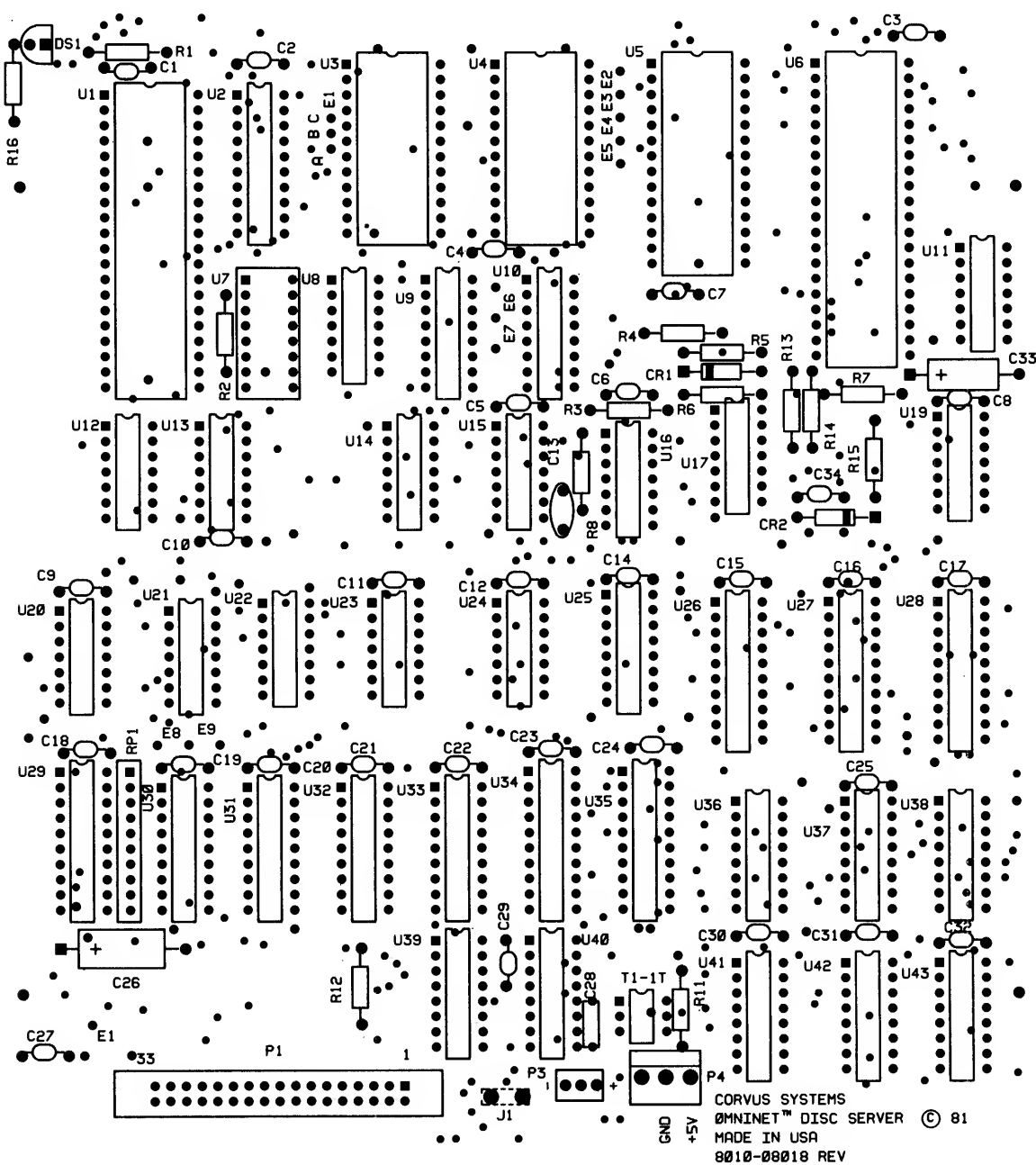


Figure 4-1. Power Supply Test and Adjustment Points

CAUTION:**Do not adjust the resistor at R4.**

- The power should also be checked at the large Molex connector at P4 to verify continuity of the power wires and connector. (The OMNINET Molex tap connector is at P3.)

**Figure 4-2. OMNINET PCA**

5. If the power supply cannot be adjusted within specifications, it must be replaced.

4.4 Troubleshooting

Initial troubleshooting of an OMNINET network should be performed prior to using OMNINET Diagnostics. Many network problems can be related to improper installation of equipment. The following provides procedures for checking network hardware.

4.4.1 Disk Drive Troubleshooting

1. Check the front bezel switches. All switches should be to the left.
2. Check the setting of the Mirror switches (5 ¼ inch drives).
3. Troubleshoot the drive over a flat cable on a known good computer.

4.4.2 Disk Server Troubleshooting

1. Run a tap directly from the Disk Server to a known good computer. This will eliminate the network and determine if the server is good. If the server does not prove good, replace the PCA and repeat this test.
2. Verify that all network devices have a unique address. The Disk Server should have address zero. Switch 7 should be in the on position on the Disk Server ONLY; switch 8 should be off for all devices.

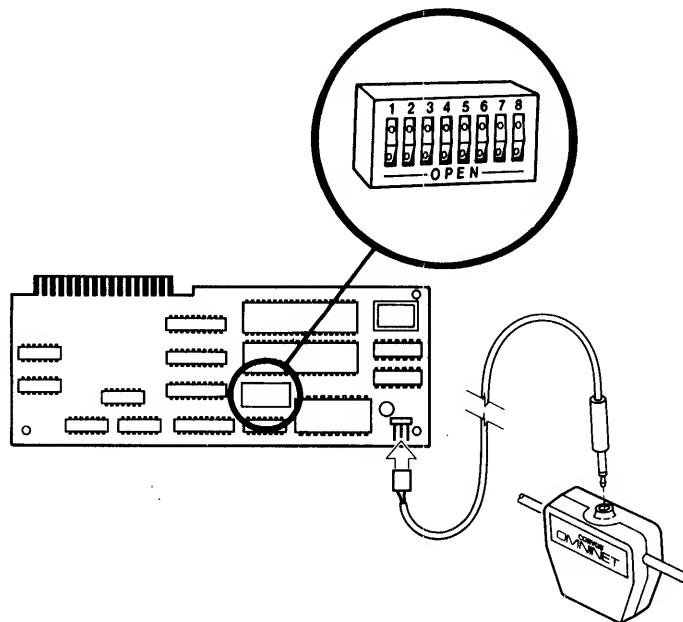


Figure 4-3. Transporter DIP Switches

3. Verify that all Transporter ROMs are the correct level. Refer to the monthly Service Update or contact the Corvus Service department.
4. Check Transporters in a known good computer.
5. Remove all network devices and reconnect them one at a time, verifying network operation each time.

4.4.3 Trunk Line Troubleshooting

1. Check that no Tap Cable exceeds 15 feet (4.5 meters).

2. Check tap connections at the Transporters, look for frayed or broken wires at the Molex connector and loose connections at the Transporter pins.
3. Check the Tap Boxes. Make sure all the wires are making contact inside and phono plugs are seated properly.
4. Verify that each end of the Trunk line is terminated with a 100-ohm, ¼-watt, $\pm 5\%$ resistor.
5. Test the resistance across the network Trunk. The value should be between 40 and 65 ohms.
6. If a problem is locally confined to one end, check the terminator at the other end of the network.
7. Check the trunk length. Active Junction Boxes are needed with trunk segments in excess of 1000 feet (330 meters). Be sure the Active Junction Boxes are hooked up correctly and powered on.

4.5 OMNINET Diagnostics

Omni Test or O Test is a diagnostic tool used to test Corvus Transporters and OMNINET network connections. This program can help to determine when the length of the network is approaching its limit. There is a relationship between the number of retries and the length of the OMNINET trunk.

NOTE:

All of the diagnostic functions discussed in this chapter are available for each type of host computer interfaced to OMNINET. The text here reflects a preliminary release of the OMNINET Diagnostics for the Corvus Concept. The examples do not reflect actual queries, responses, or displays. This chapter is intended as a generic description of OMNINET Diagnostics only.

4.6 Preparation for Running the Diagnostics

To execute the OMNINET test you will need at least 2 stations on the network, one receiving station and one sending station. Verify that each station and the Disk Server have unique addresses. To do this follow the instructions for setting the microswitches in section 2.6.

Select the OMNINET test from the Diagnostics volume.

The screen displays:

Messages sent = 0 Give ups = 0 Attempts = 0

Socket	Status	Count	Source
1	(80)	Not set up	0
2	(90)	Not set up	0

Host number = xx Slot = 5

Socket - The socket number or "sub-address" within the host by which messages may be routed.

Status - The current state of that socket: 'Not set up' or 'Ready.'

Count - The number of packets that have been received on that socket. This is a 16-bit signed integer so you may see a negative number if you run for a long time.

4.7 OMNINET Test Functions

Once the OMNINET Diagnostics program has been loaded the following functions are available:

- Receive Set
- Receive End
- Send
- Send End
- Show Counters
- Zero
- Who
- Exit

These will each be described individually.

4.7.1 Receive Set

This function is used to set up the host as a receive unit

Set up a receive:

Receive on which socket?

Enter 1 or 2 and press return.

Screen displays:

Setting up to receive 64 bytes

Setting up header to 0 bytes

Command status → Socket in use

The status of the appropriate socket now says "ready" and the Omni Test functions are again available for selection.

4.7.2 Receive End

This is used to disable a receive socket.

Selecting Receive End, the screen displays:

Stop receiving on which socket?

Enter 1 or 2

The status of the selected socket will now read "Not set up" and the Omni test functions keys are displayed.

4.7.3 Send

This function sets the number of the host which will receive and begins the test.

The screen displays:

Send a Packet:

Send to what host?

After entering a host number, 1 to 63, the screen displays the query:

Send to which socket?

Enter 1 or 2 depending on which socket you have selected on the appropriate host to receive.

The screen then displays:

Sending 64 bytes

Sending 0 byte header

Send how many ? [0 = forever]: 0

After selecting how many packets are to be sent, the test begins and the screen will display:

Command status → Successful

The command status will be successful if the receive host and the send host have both been properly initialized. If the receive host has not been initialized, the Command status will read "Sent to an uninitialized socket."

4.74 Send End

Send End will cause the host to discontinue sending packets.

The command window displays:

Sending finished... Select Omni Test function

4.75 Show Counters

Show Counters causes the counters to be displayed:

Retry[0] = 0	Retry[7] = 0
Retry[1] = 0	Retry[8] = 0
Retry[2] = 0	Retry[9] = 0
Retry[3] = 0	Retry[10] = 0
Retry[4] = 0	Snd too long = 0
Retry[5] = 0	Uninitd skt = 0
Retry[6] = 0	Recv errors = 0

Retry - Number of retransmissions of packet attempts.

Snd too long - Send packet user data portion was too long for buffer that was set up to receive.

Uninitd skt - Packet was sent to an uninitialized socket.

Recv errors - A packet was received but did not contain the expected information.

4.76 Zero

This resets all counters to zero including Messages Sent, Attempts, and Give Ups.

4.77 Who

Selecting Who causes the screen to display a list of all active hosts on the OMNINET network, hosts attached to OMNINET and powered on. Echo packets are sent to every possible host number and are acknowledged at the Transporter level regardless of the computer or software type. This feature will help you to check if the Transporter address switches have been set up correctly. The host number of the computer that is running the Who will be indicated by an asterisk.

An example of the screen display is:

Active OMNINET Transporters ("*" indicates this host)

0	7	37	54	63
2	25	41	58	
3	32	43	61	
4	33*	45	62	

4.78 Exit

This is used to exit Omni Test, and the command line prompt is displayed.

4.8 Additional Terminology

Messages Sent - The number of packets successfully sent acknowledge.

Attempts - The number of send packets attempted.

- Give Ups - The default value of 11 Retries before the Transporter "gives-up" and stops attempting to send that packet.
- Slot - The slot number (or lowest slot) into which a Transporter is plugged.
- Host Number - The host Transporter address of the computer executing this program and connected to the network. Legal Transporter addresses are 1 through 63. (The Disk Server should have address number 0.)
- Packet - A unit of information passed from one Transporter to another.
- Command Status - Reports on the failure or success of the last command.
- Give Ups + Messages Sent = Attempts

4.9 Running OMNINET Diagnostics

This example will use host number 20, socket 1, to receive; and host number 25 to send.

Set up host 20 to receive.

After loading the test program, select Receive Set. The screen displays::

Set up a receive:

Receive on which socket?

Enter 1 and <return>. The screen now displays:

Set up a receive"

Receive on which socket? 1

Setting up to receive 64 bytes

Setting up header to 0 bytes

Command status —> Socket in use

Messages sent = 0 Give ups + 0 Attempts = 0

Socket	Status	Count	Source
1 (80)	Ready	0	
2 (90)	Not set up	0	

Host number = 20 Slot = 5

Set up send on host number 25.

After loading in the test program, select Send Set, the screen displays:

Send a Packet:

Send to what host?

Enter 20 and <return>. The screen now displays:

Send to which socket?

Enter 1 and <return>. The screen now displays:

Sending 64 bytes

Sending 0 byte header

Send how many? [0 = forever]:

For this example enter 100 and <return>. This will cause host 25 to begin sending packets to host 20. The command status should now be "Successful."

4.10 OMNINET and Modified Apple II Computers

The Radio Frequency Interference (RFI) modified Apple II has a DC connection between the electrical ground and earth ground. The modification serves to reduce the amount of RFI. This model can be identified by the metal plate attached to the rear of the chassis.

When the earth ground of two devices is not equal, the same voltage, a differential is created. Electrically, this differential is resolved by the path of least resistance.

In the case of OMNINET, the two devices are RFI Apple microcomputers; the path of least resistance is the OMNINET connection. The most severe cases can result in the driver/receiver chip being destroyed.

The most appropriate solution is to have a single ground, common to all electrical outlets. Check with a qualified electrician to have the necessary changes made.

CHAPTER 5
UTILITY SERVER INSTALLATION

CHAPTER 5

UTILITY SERVER INSTALLATION

5.1 Scope of Chapter

This chapter provides an overview of installation procedures. Installation of the Utility Server is detailed in the Utility Server Installation Guide. Instructions for establishing communication with the server may be found in the Manager's Guide for each specific network type.

5.2 Introduction

The Corvus Utility Server is enclosed in a beige, high-impact, foam-injection cabinet which contains the Utility Server printed circuit assembly and power supply. The Server is manufactured in one of two configurations, for use with 110-120 VAC, 60 Hz or 220-240 VAC, 50 Hz. The label on the bottom of the server gives the voltage rating. If the rating does not match the local voltage, contact your Corvus dealer. Connection to the network is made with a standard OMNINET tap cable.

5.3 Hardware Installation

The Utility Server installation package contains:

Utility Server,
Power Cord,
Corvus Tap Box, and
Tap Cable.

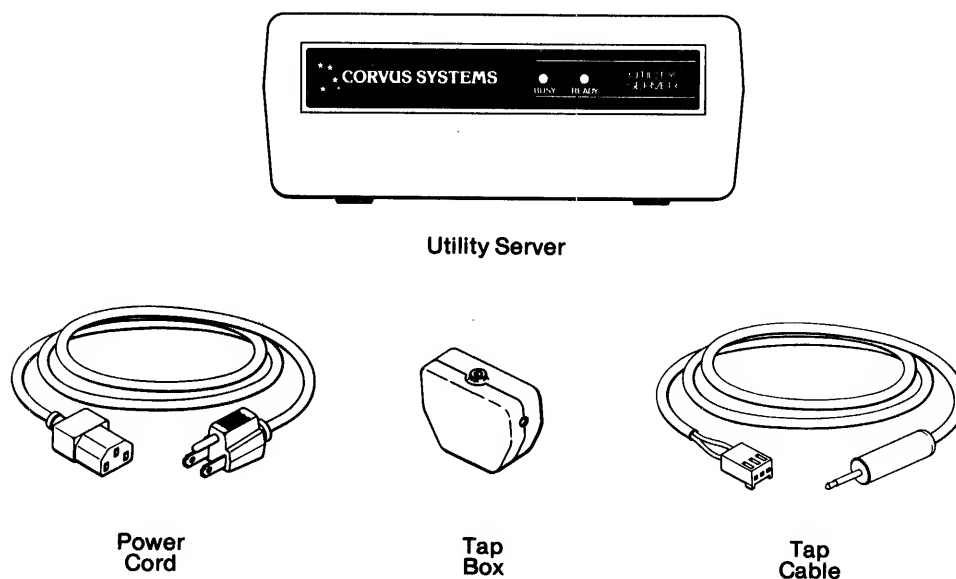


Figure 5-1. Utility Server Installation Package

5.3.1 Network Tap

The Utility Server may be installed anywhere on the OMNINET trunk line. All limitations to trunk length, Active Junction Boxes, terminating tap boxes, etc. are unchanged. The tap box should not be within 6 feet (2 meters) of another tap box.

Instructions for installing a simple tap box can be found in section 2.4.1.

5.3.2 Network Address

Like all network devices, the Utility Server must have its own unique address. To access the address DIP switches remove the cabinet cover by loosening the screws on the back of the server and lifting off the top.

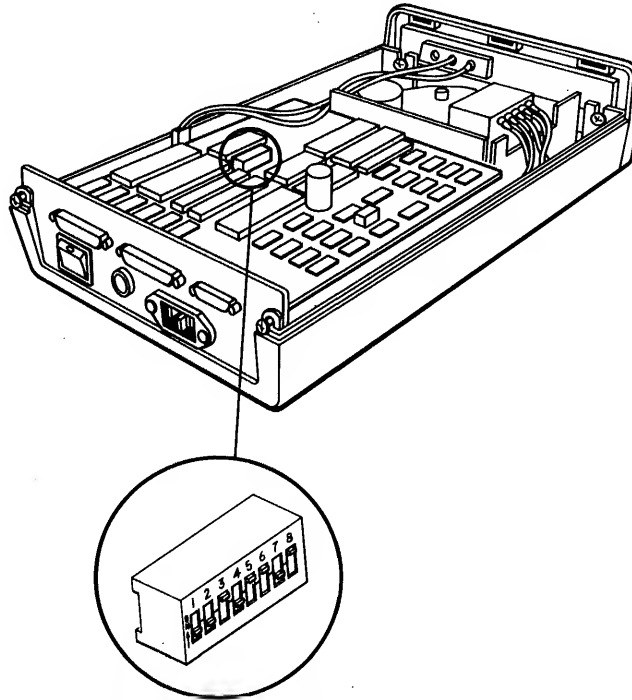


Figure 5-2. Utility Server Circuit Board and Switch Unit

When viewing the PCA from the back of the Utility Server, the switch unit will be slightly to the left of the center. Set the device address using the switch settings shown in table 2-1.

Replace the cover on the server and tighten the screws.

Write the network address on a slip of paper and attach it to the outside of the server.

5.3.3 Cable Connections

Plug the tap cable into the tap box for the server. Connect the other end of the tap cable to the three pronged Molex connector on the left side of the server back. When properly installed, the connector will snap into place.

On the back of the Utility Server are three ports for attaching peripheral devices such as printers and modems. The SERIAL 1 and SERIAL 2 ports are RS-232C ports. To connect a device to one of these ports, use a cable with an RS-232C male plug on one end, and a connector suitable for the device on the other. Section 6.5.1 describes the pins used by the Utility Server.

The PARALLEL 1 port permits a parallel printer to be connected. A cable for this port must have a 15-pin male connector at one end and a connector suitable for the printer at the other. Section 6.5.2 describes the pins used by the Utility Server.

Finally, attach the AC power cord. Plug the power cord into the AC power outlet.

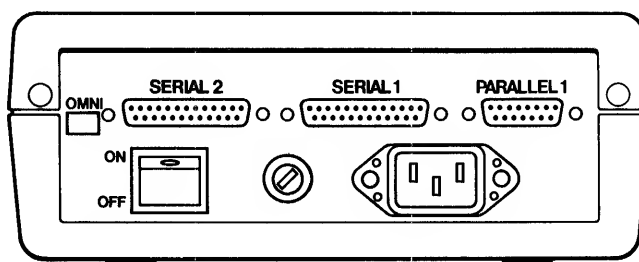


Figure 5-3. Utility Server Rear View

5.4 Firmware

As the instructions for installing Utility Server programs vary with the microcomputer and Constellation level, see the appropriate Utility Server Manager's Guide for details.

5.5 Port Configuration

Port parameters for each port must be set to accommodate the attached printer or modem. Steps are given for entering the parameters on one port. The other ports are set in a similar fashion. Port configuration is normally done by the system manager, and as such, the necessary utilities may not be accessible to other users.

The procedures to access the Printer Server Utilities will again be dependent on the type of microcomputer and the Constellation level. The setting of parameters, however, is very similar for all systems.

Once the port has been selected, selecting the parameter to be set is done by entering the appropriate key. The program will then ask you to enter a new value for the parameter. As soon as you enter the new value, the screen will display the new value and you will be able to change another parameter.

Serial Port

HARDWARE PARAMETERS

B	-	Baud Rate	:	1200
C	-	Char Size	:	8
P	-	Parity	:	DISABLED
H	-	Handshake	:	LINE/DCD/NORMAL

DESPOOL PARAMETERS

A	-	Active	:	FALSE
N	-	Name of Pipe	:	PRINTER
D	-	Device Type	:	LinePrinter
L	-	LineFeed ON	:	FALSE
M	-	Max Lines/Page	:	55
T	-	Tab Spacing	:	8

E — Exit

Please select an option _____

Serial Port Parameters

Parallel Port

HARDWARE PARAMETERS

C - Char Size : 8
P - Parity : Disabled

DESPOOL PARAMETERS

A - Active : FALSE
N - Name of Pipe : PRINTER
D - Device Type : LinePrinter
L - LineFeed ON : FALSE
M - Max Lines/Page : 55
T - Tab Spacing : 8

E — Exit

If only a few values are possible, the program will give you a choice of these values. Press the key for the value you want followed by RETURN. If the program asks for an actual value, type in the value followed by RETURN. When changing a parameter that is only TRUE or FALSE, the value of the parameter will change as soon as you press the key; no RETURN is necessary.

When all parameters for each port have been set, the Hardware parameters and the Despool parameters, the changes must be saved to a new configuration file. The save command will be available after depressing E for Exit. Save the configuration file to the correct OMNINET address number. (The address should be taped to the outside of the server.)

The Utility Server Manager's Guides give details for setting the parameters and the time.

5.6 Printing

Follow these procedures to print through the Utility Server:

1. Turn on the printers attached to the Utility Server.
2. Turn on the Utility Server. Depending on their setting, the printers attached to the Utility Server may print a few lines as the communication is established between the server and the printer.
3. Spool to the server selecting the appropriate pipe name.

It is not necessary to power-down the Utility Server at the end of each day. Whenever the server is turned off, the time and date must be reset when it is turned on.

CHAPTER 6
UTILITY SERVER FUNCTIONAL DESCRIPTION

CHAPTER 6

UTILITY SERVER FUNCTIONAL DESCRIPTION

6.1 Scope of Chapter

This chapter provides an overview of the Utility Server operation. The hardware is divided into three major sections. The transporter section is detailed in chapter 3. The processor and I/O sections are described here. Key signals and bus lines are described. A list of some of the Utility Server hardware equates may be found in Appendix E.

6.2 Introduction

The Utility Server consists of three major elements; the transporter, the I/O section, and the processor section. Although functionally discrete, all sections reside on one printed circuit assembly.

The transporter section performs the same functions for the Utility Server as the OMNINET Disk Server does for the disk system; it permits communication between peripheral devices and the network.

The processor section and I/O section allow the Utility Server to communicate with more than one device at a time.

6.3 Transporter

The transporter section is primarily a generic OMNINET Transporter. It handles all protocol with the OMNINET network, DMA transfers, and communicates directly with the processor section of the Utility Server.

Chapter 3, OMNINET Functional Description, contains information on the Transporter functions.

6.4 Processor Section

The processor section of the Utility Server is a Z-80 microcomputer with 8192 bytes of ROM and 64K bytes of dynamic RAM.

6.4.1 Boot ROM

The boot ROM is a 2764 erasable PROM. The EPROM can contain up to 8000 bytes of information. At the time of this writing, the EPROM contains nearly 4000 bytes of Z-80 code. When the Utility Server is powered-up, the code within the EPROM is used by the Z-80 to initialize hardware, perform diagnostics on the hardware, set-up dispatcher routines, and load the boot image into dynamic RAM, DRAM.

6.4.2 Z-80 Microprocessor

The Utility Server utilizes a standard 2.5 MHz Z-80 microprocessor. The system clock, approximately 1.78 MHz, is generated by the MC6883 synchronus address multiplexer. The Z-80 has a 16-bit address and an 8-bit data bus.

6.4.3 64K X 1 Bit Dynamic RAM

The process section contains eight 4164 dynamic RAM's, DRAM. Each contains about 64,000 bits. The memory array is divided into 8 RAM chips across for a total of 64K bytes of memory space.

6.4.4 MC6883/74LS783

The MC6883 is a synchronous address multiplexer that supplies addressing for up to 64K bytes of DRAM, row address selects (RAS), column address selects (CAS), and system timing of 1.78 MHz. The frequency of 1.78 MHz is derived internal to the MC6883 by dividing an external clock of 14.318 MHz by a count of eight.

6.4.5 Key Signals

The key signals of the processor section are:

θ Phi is a 1.78 MHz clock signal that is used as system timing. This signal is derived from the MC6883 address multiplexer.

M1	This active low Z-80 output indicates that the current machine cycle is the OP code fetch cycle of an instruction execution. M1 also occurs with IORQ, I/O Request, to indicate an interrupt acknowledge cycle.
IORQ	This active low, tristate Z-80 output indicates that the lower half of the address bus holds a valid I/O address for an I/O read or write operation. Interrupt acknowledge operations occur during M1 time while I/O operations never occur during M1 time.
ROMOFF	ROM Off is a programmable active low signal which disables the output of the boot ROM when activated, 'true.' The program equate for this signal is 10H.
MREG	Memory Request is an active low, tristate Z-80 output which indicates that the address bus holds a valid address for a memory read or write operation.

6.5 I/O Section

The I/O section of the Utility Server can handle the handshaking protocols of three printers at the same time. The I/O section consists of two RS-232 serial ports, a parallel port, and a Corvus disk bus.

6.5.1 232C Serial Port

The following pins of a standard RS-232C connector are used on the serial port:

Pin	Signal Name	Source	Function
1	protective ground	none	chassis Ground
2	received data	printer	received serial data
3	Transmitted data	Utility Server	Transmitted Serial data
4	Clear To Send	Printer	
5	Request to Send	Utility Server	
7	Signal Ground	none	Return path data control signals
8	Data Terminal Ready	Utility Server	When U. Server is On-line, signal is at Positive EIA level
9	Carrier Detect	Printer	U. Server Check line for on-line printer

6.5.2 Parallel Interface Port

The following are pin descriptions for the parallel port.

Pin	Signal Name	Source	Function
1	STROBE	Utility Server	0.5 Usec pulse used to clock data from Server to printer logic
2	DATA 1	Utility Server	Input Data levels High = 1, Low = 0
3	DATA 2		
4	DATA 3		
5	DATA 4		
6	DATA 5		
7	DATA 6		
8	DATA 7		
9	DATA 8		
10	ACKNLG	Printer	Pulse low means Char was received printer ready to receive

Pin	Signal Name	Source	Function
11	BUSY	Printer	printer cannot receive data, active high
12	PE	Printer	High level indicates out of paper
13	SLCT	Printer	high level indicates printer selected
15	ERROR	printer	low level indicates an error
16	OV	none	logic ground

6.5.3 Z-80 DART

The Z-80 Dual Asynchronous receiver transmitter, DART, is a dual channel, multi-function peripheral component. The Z-80 DART is used as a serial to parallel, parallel to serial converter or controller in asynchronous applications. The 40-pin chip can be divided into five functional blocks:

- CPU data bus, pins 1-4 and 37-40;
- control lines from CPU, pins 35, 21, 8, 36, and 32;
- daisy-chain interrupt control, pins 5-7; and
- two separate asynchronous control lines to and from the RS-232 ports.

The DART interacts with the Z-80 CPU by sharing data, address, and control buses as well as being part of the Z-80 interrupt structure.

6.5.4 Counter/Timer Circuit

The Z-80 counter time circuit is a programmable component with four independent channels which provide counting and timing functions for the Z-80 microcomputer. The internal structure of the Z-80 CTC (counter/timing circuit) consists of a Z-80 CPU bus interface, internal control logic, four sets of channel logic, and interrupt control logic. The CTC has the capability to generate an interrupt vector for each separate channel. The four channels are connected to contiguous slots of the Z-80 priority chain; chain zero has the highest priority. The Utility Server uses channel zero as a baud clock for the Z-80 DART. The interrupt vectors of the other three channels are used for the OMNINET port, parallel port, and calendar clock updating.

6.5.5 Key Signals

Following are key signals not previously described:

EOUT	Enable Out — On normal operations the Monochip routes the enable clock output of the 6801 directly to EOUT. When the 6801 requests a DMA cycle, the Monochip freezes the 6801 and begins generating its own EOUT signal.
FAST/SLOW	300-4800 SIO Baud clock is derived from CTC. 9600 Baud clock is derived from EOUT.
ZERO COUNT/ TIME OUT	In either counter mode or timer mode of the CTC chip an active pulse appears on this line if the counter decrements to zero. The Utility Server may be programmed to use this line as the DART Baud clock.
DART BAUD CLOCK	This clock signal is applied to the transmitter clock and the receiver clock inputs of the Z-80 DART. This signal may be derived from the CTC or the EOUT, depending on the programming of the Utility Server.
Z-80 INT	Z-80 Input — This active low input to the Z-80 microprocessor is used as an I/O interrupt request to the Z-80. When so programmed, this signal is output from the CTC chip to enable interrupts. It has a zero condition within the down counter.
HDINT	Header Interrupt — This active low signal is a 5 μ sec pulse used as the OMNINET interrupt line to the CTC chip. The signal is pulsed any time the return code of the result record has been modified by the transporter.

6.6 Power Supply

The Utility Server power supply is the same as that used in the OMNINET Disk Server. It is a model HB/5 manufactured by Power One. It provides $5.0 \text{ VAC} \pm 0.10 \text{ VAC}$.

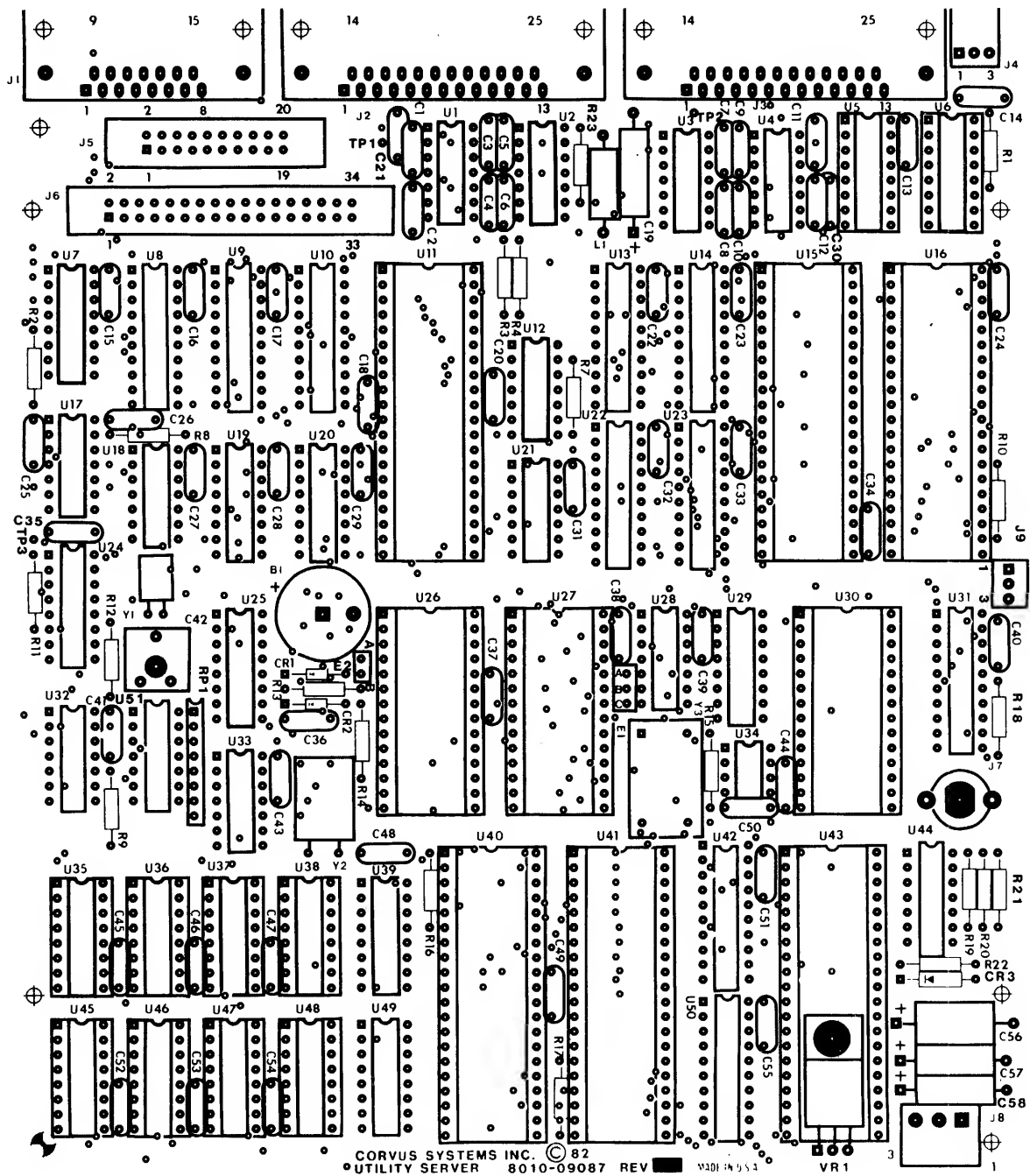


Figure 6.1 Utility Server PCA

CHAPTER 7
UTILITY SERVER TROUBLESHOOTING

CHAPTER 7

UTILITY SERVER TROUBLESHOOTING

7.1 Scope of Chapter

Simple troubleshooting and servicing procedures for the Utility Server are discussed in this chapter. A method for determining if the server is operating correctly is given. The measurement and adjustment of the power supply is also explained.

7.2 Introduction

The Utility Server has two physical elements; the printed circuit assembly (PCA) and the power supply. Adjustment of the power supply is the only field serviceable procedure that may be performed on the server. The following steps should be done before making any adjustments to the server:

1. Verify that the ports have been properly configured. If the server still does not work, perform the server test changing parameters as given.
2. If the server does not respond during the test, reinstall the server utility programs; repeat the test.
3. Next, the power supply voltage should be measured and adjusted if necessary.
4. After adjusting the power supply, run the server test again. If the test is successful reconfigure the parameters once again.

7.3 Server Test

The server test is used to verify the functioning of the Utility Server. Variables are reduced by removing all devices from the server.

1. Detach all printers or devices from the Utility Server.
2. Configure the ports as shown below:

Serial Port 1

Active:	TRUE
Handshake:	Xon/Xoff
Pipe Name:	Printer
Other Parameters:	Any Values

Serial Port 2

Active:	FALSE
Other Parameters:	Any Values

Parallel Port

Active:	FALSE
Other Parameters:	Any Values

NOTE:

Since the serial port 1 handshake is set to Xon/Xoff, the utility server will send data from its serial 1 port until it receives an Xoff signal from the printer. Because no printer is attached to serial port 1, the utility server will never receive an Xoff signal and will keep despooling until it reaches the end of the spooled file.

3. Check the OMNINET address of the Utility Server. This address should be taped to the outside of the server. If the address is not taped to the outside or if there is some doubt of the number, check the switch setting on the server PCA and compare it to the value found in table 2.1. Save the configuration address to the correct OMNINET address.
4. Turn the Utility Server off and then on again.
5. Spool a small file to pipe Printer. Write down the spool number.

6. Use the Constellation managers program to list the contents of the PIPES area. If the pipe is not listed, or the pipe gradually shrinks and then disappears with repeated listings, your utility server is despooling correctly. If your pipe does not disappear, repeat the procedures for installing the Utility Server utility programs.
7. If the server continues to fail, replace the PCA with a known good unit.

7.4 Power Supply

The Utility Server, like the OMNINET Disk Server, uses an HB/5 power supply manufactured by Power One. This supplies 5 volts DC power to the server. See Figure 4-1.

Ageing of the power supply and normal heating and cooling of the server electronics can cause the power supply voltage to drift over time. To measure and adjust the supply, follow the steps below.

WARNING:

Extreme caution should be exercised when adjusting the power supply. High voltages present a potential hazard. DO NOT TOUCH THE AC PORTION OF THE SUPPLY.

1. Remove the two screws from the rear of the server and lift off the cover.
2. Check the voltage across the two power supply terminals. The reading should be 5 volts ± 0.10 volts.
3. If the power supply is not within specifications, the power supply is adjusted by turning the "V. ADJ." resistor at R6.

CAUTION:

Do not adjust the resistor at R4.

4. The power should also be checked at the large Molex connector at J8 to verify continuity of the power wires and connector.
5. If the power supply cannot be adjusted within the specifications, it must be replaced.

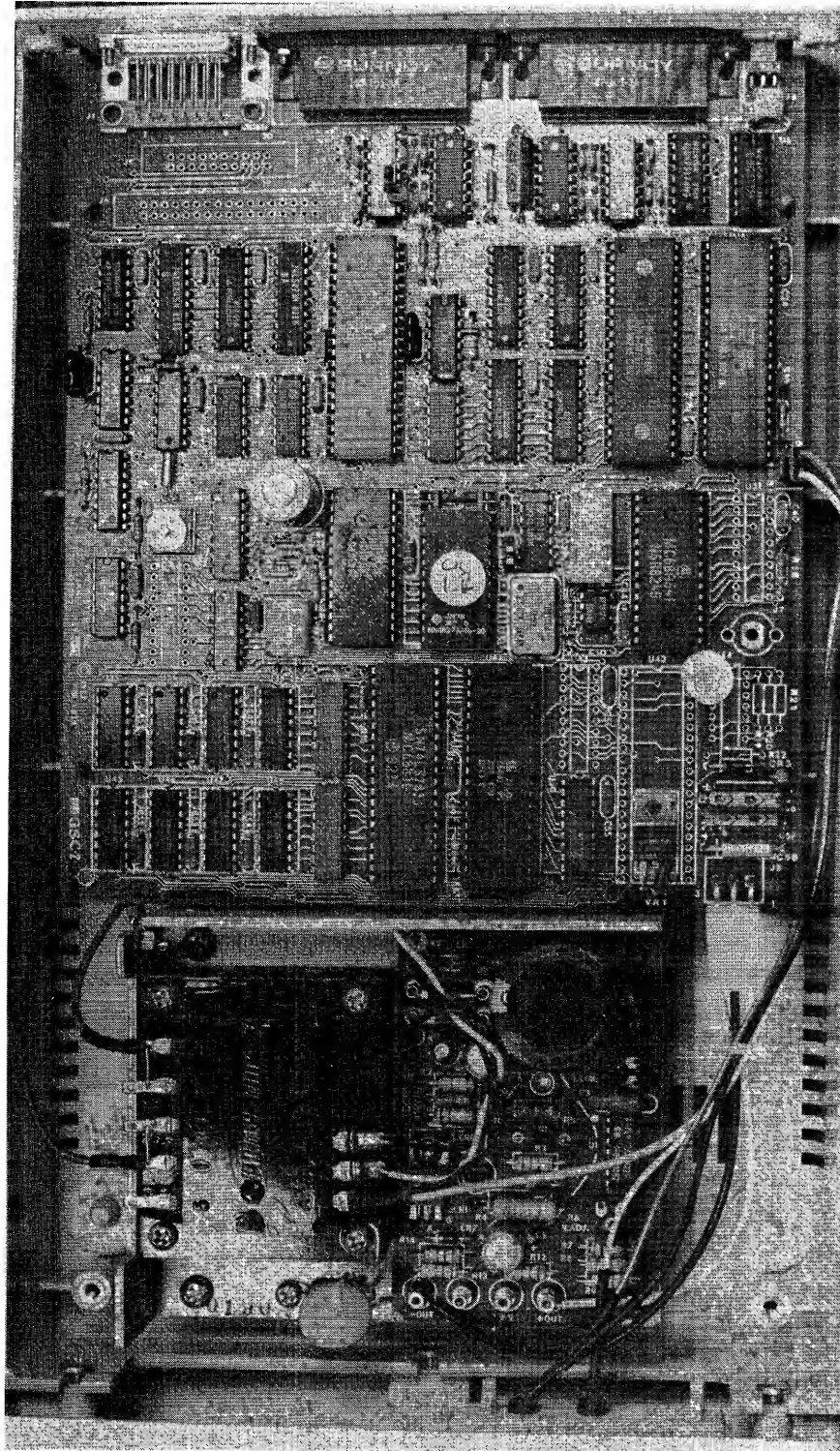


Figure 7-1. Printed Circuit Assembly and Power Supply

7.5 Replacing the Fuse

The Corvus Utility Server has a slow-blow fuse to protect the server from harm. If the fuse burns out, it must be replaced. The server will not work without a fuse.

The following is the procedure for replacing a fuse in either the 110 VAC or 220 VAC server. (The label on the bottom of the server gives the voltage rating. If the voltage rating does not match the local voltage, contact your Corvus dealer.)

1. Turn off the Utility Server and unplug the power cord from the AC outlet.

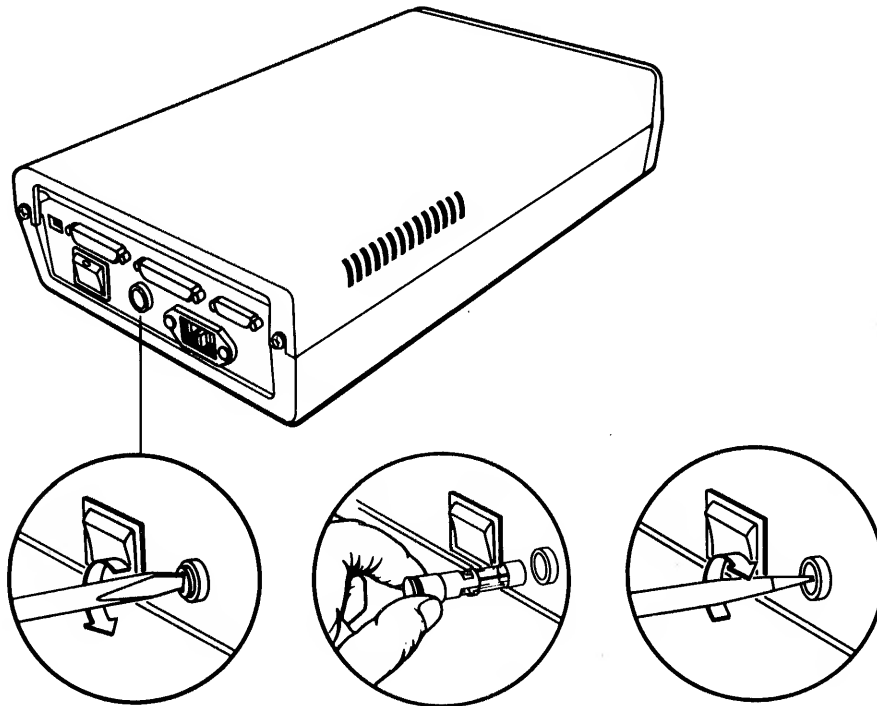


Figure 7-2. Fuse Replacement

2. The fuse holder is located the back of the server between the AC power receptical and the power switch. With a screwdriver, push the central cylinder in and turn counterclockwise. The cylinder will pop out as the pressure on the screwdriver released.
3. Remove the fuse from its holder.
4. Replace the fuse with a new one.

100-120 VAC	0.5 amp
220-240 VAC	0.25 amp
5. Return the fuse to its holder.
6. Latch the cylinder in place. Push the cylinder in with a screwdriver, turning clockwise to latch the fuse.

CHAPTER 8
MULTIPLEXER INSTALLATION

CHAPTER 8

MULTIPLEXER INSTALLATION

8.1 Scope of Chapter

This chapter covers the installation of the Multiplexer hardware and the setting of the Multiplexer parameters.

8.2 Introduction

The Corvus Multiplexer may be used in three basic configurations; as a Host Multiplexer, a Master Multiplexer (or Mux-Mux), or as an LSI-11 Multiplexer. The Host Multiplexer is used in a single level network. The Master Multiplexer is used in two level networks where more than 8 devices are to be connected or where a distance of more than 50 feet (15 meters) is needed between the disk drive and a device. The LSI-11 Multiplexer is used to connect multiple LSI-11 computers or to connect an LSI-11 computer and some other type of computer to the same disk drive. The LSI-11 Multiplexer can only be used in a single level network.

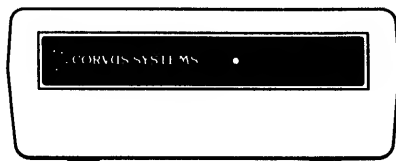
The newest revision of the Corvus Multiplexer is enclosed in a white, high-impact, foam-injection cabinet which contains the Multiplexer printed circuit assembly and a power supply. Early models were enclosed in black plastic boxes and had either a stand alone power supply, or no power supply.

The Multiplexer power supply operates on either 110-120 VAC or 220-240 VAC, 50Hz or 60Hz. The PCA contains all the Multiplexer electronics, the eight device ports and the Master or Host connector. All connectors are 34-pin connectors.

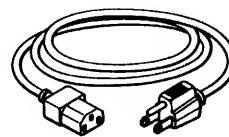
8.3 Receiving the Multiplexer

The Multiplexer installation package contains the following items:

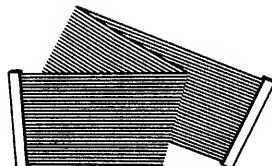
1. A Corvus Multiplexer,
2. An AC power cord,
3. A 3 foot (1 meter) flat cable,
4. An Upgrade software diskette, and
5. An Installation Manual.



Multiplexer



Power Cord



Flat Cable



Software
Diskette

Figure 8-1. Multiplexer Installation Package

The Interface option for each specific microcomputer contains:

1. An Interface PCA.
2. Flat ribbon cable can be ordered in various lengths.

8.4 Multiplexer Jumpers

Jumpers on the Multiplexer PCA must be set to correspond to the type of Multiplexer being used. The configurations are:

HOST MUX	MASTER MUX	LSI-11 MUX
Jumper E9-E10	Jumper E5-E8	Jumper E4-E5
	Jumper E6-E7	Jumper E9-E10
	Cut E5-VCC	Jumper U11/12-U12/3
	Cut E7-E8	Cut E5-VCC
		Cut U12/2-U1½
		Cut U12/2-U12/3
		Add 470 U12/2-U1½
		Add 200pF U1½-Gnd

Table 8-1. Early Revision Board Jumpers

HOST MUX	MASTER MUX	LSI-11 MUX
Jumper J9-J10	Jumper J11-J12	Jumper J10-J13

Table 8-2. Late Revision Board Jumpers

When shipped, the Multiplexer PCA jumpers are configured as specified when ordering. See section 1.3 for serial number identification of models.

8.5 Multiplexer Table

The Multiplexer Table is used to inform the controller of the network topology. The ports are numbered counterclockwise starting at the lower right hand corner. The display of the screen represents the actual physical appearance of the Multiplexer.

M	M	C = Computer
M	M	L = LSI-11
M	M	X = Hard Disk
M	M	N = Nothing
X		

Table 8-3. Multiplexer Table

When a Multiplexer network is first installed the default condition assumes a single level network, all ports are set to M for Multiplexer. For a single level network without LSI-11's, all ports should be set to M. The network will not work if the table is not configured in this way. The Multiplexer Table must be modified for any other topology. These modifications can be made either through Drive Diagnostics or Constellation Manager Programs.

If the network contains a Master Multiplexer, as in a two level network, or an LSI-11 Multiplexer is being used, the ports should be configured to reflect the network. The controller must know if a Multiplexer or an LSI-11 is connected to any of the ports on the Multiplexer. In a two level configuration, the controller will poll the Master Multiplexer and the Host Multiplexer. If an LSI-11 is connected to the Multiplexer, special firmware must be loaded for the LSI-11 controller card.

LSI-11's may be used **ONLY IN A SINGLE LEVEL** configuration.

8.6 Installation of the Multiplexer

Be sure the proper line voltage has been selected. Look at the bottom right corner on the back of the Multiplexer. There you will find the AC power cord connector and fuse receptacle. Directly underneath the fuse holder, the voltage setting is displayed. If you must change the voltage setting, following the instructions in section 1.7 for setting the proper voltage.

Approximately two inches below the three indicator Light Emitting Diodes (LED's) of the disk drive, the front panel protrudes slightly. Under this protrusion are the four drive controller switches. The third switch from the right, as you face the front of the drive, is the Multiplexer switch. This switch must be set to the right for use with the Corvus Multiplexer. The remaining three switches should be set to the left. The leftmost switch is set to the right for use LSI-11 microcomputers.

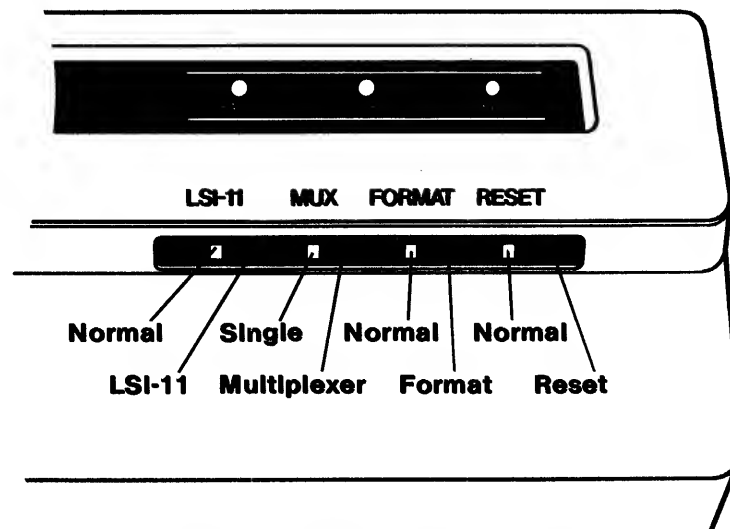


Figure 8-2. Disk Drive Front Bezel

Disconnect the flat cable from the PROCESSOR port of the Corvus disk drive. Plug either end of the 3 foot (1 meter) cable, supplied with the Multiplexer, into the now empty PROCESSOR Port. When facing the back of the drive, the colored stripe on the cable should be to your right: the cable exits down and away from the drive.

Open the Multiplexer enclosure by loosening the two hex screws on the rear of the foam boxes, six screws along the sides of metal boxes. Lift off the lid. Connect the other end of the 3 foot cable to the center connector on the Multiplexer PCA assembly as shown in Figure 8-3. Again the colored stripe should be to the right when facing the back of the Multiplexer.

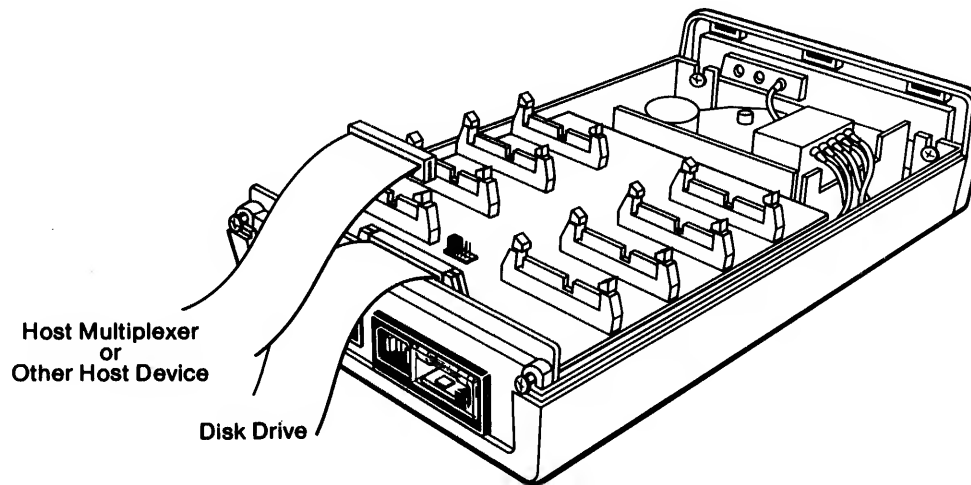


Figure 8-3. Cable Installation

Plug the flat interface cable which had been attached to the drive's PROCESSOR Port into any of the eight remaining connectors on the Multiplexer PCA. The cable exits in the same manner as the center cable, colored stripe to the right.

Additional interface cables are connected to the remaining connectors in the same manner. For a two level Multiplexer, Host Multiplexers are connected to these ports.

An OMNINET Disk Server may be used in a Multiplexer network. A flat cable is installed between the Multiplexer and the OMNINET. One end of the cable is connected to one of the eight Host Multiplexer connectors; the other end is connected to the 34-pin connector on the OMNINET PCA. When this is done in a two-level network the OMNINET port on the Multiplexer Table should be considered as a computer.

Replace the cover and connect the AC power cord to the Multiplexer then to the power outlet. Power on the Corvus Multiplexer first followed by the Corvus drive. When the drive is first powered on all three indicator lights on the front panel come on. In about twenty seconds the drive should come ready and only the READY light should remain on. If after one minute, the drive does not come ready, flip the reset switch (the rightmost switch on the front of the drive) to the right momentarily. When the drive comes ready, you may upgrade the operating system on the disk.

NOTE:

Do not attempt to initialize a drive or run diagnostic routines through a Multiplexer.

8.7 Polling Parameters

The polling parameters determine the amount of time each computer is allowed on the network during each polling sequence. The first parameter specifies the maximum length of time allowed between transactions permitted while maintaining the data link. The second parameter is required for interrupt servicing, and the third parameter is the number of transactions allowed any one computer during a polling sequence.

On the first transaction during a polling sequence, the computer has $102\ \mu\text{S}$ to respond to the READY signal, this number is fixed by the firmware. On subsequent transactions in the same polling sequence, the computer must respond to READY in the time specified by the first parameter. For all drives, this time is computed by taking the parameter and multiplying it by $102\ \mu\text{S}$; the default value of 180 gives the computer 18.36 mS to respond.

The second parameter determines the length of time after the READY line is negated before the data link is broken and the controller switches the Multiplexer to the next port. This parameter should be long enough to allow the host computer to complete its longest interrupt service routine (ISR) and still return to the driver before the time is up.

The default value, 16 for non H-Series drives and 26 for H-Series drives, allows 102 μ S for the ISR. In some computers, the ISR is longer than 102.4 μ S, which means that if the computer encounters an interrupt during a disk transfer, the computer and the hard disk may get out of synchronization. This can cause the operating system to encounter FFh and 8Fh errors returned by the drivers. Modifying the second polling parameter to 32 for non-H-Series drives or 52 for H-Series drives will accommodate most computers but will increase the polling time on all inactive ports by 50 percent.

The third parameter is the maximum number of transactions which can occur between a host and the hard disk before the polling sequence is resumed. This maximum can only be attained if the first two parameters are compatible with the host system. Each Read and Write counts as one transaction. The default value of 32 allows 32 transactions to occur before normal polling is resumed.

A fourth parameter appears in the Diagnostic program. This parameter is not used at the time of this writing and should be set to zero.

Parameter	1	2	3	4
non H-Series	180	16	32	0
H-Series	180	26	32	0

Table 8-4. Polling Parameters

The procedures for modifying the polling parameters are given in the "Corvus Multiplexer Guide" for each specific microcomputer.

CHAPTER 9
MULTIPLEXER FUNCTIONAL DESCRIPTION

CHAPTER 9

MULTIPLEXER FUNCTIONAL DESCRIPTION

9.1 Scope of Chapter

This chapter provides an overview of the Multiplexer hardware and software. Signal lines are discussed. Network management software utilities are mentioned.

9.2 Introduction

The Multiplexer is comprised of four basic components; the address and function decoder, the port selector, the multiplexers and demultiplexers, and the bus drivers. Each of these will be described individually.

9.3 Address and Function Decoder

The address decoder is enabled by *ALTSEL, BUSDIR and data line 7. The hard disk controller selects a multiplexer function by asserting *ALTSEL while setting BUSDIR low (drive to peripheral direction) and then allowing the READY line to rise. When *ALTSEL is asserted, BUSDIR is low and data line 7 is high, U16 is enabled.

U16 also serves as a function decoder, the function of its output being determined by the configuration of the board jumpers. Board jumpers are configured for the various multiplexers as shown in Tables 8-1 and 8-2. There are several different revision levels of the Multiplexer PCA, the distinct difference being the jumpers themselves. To distinguish the two different types of jumpers, the late revision PCA's have stakes and jumper blocks located in the center of the board between ports 0 and 7; the early revision boards require cuts and jumper wires to reconfigure them.

Data lines 4-6 determine the function of the output lines of U16, based on the configuration of the board jumpers. Data line 6 must be high in order to enable any of the three functions. Data lines 4 and 5 determine which of the three functions are selected, based on the configuration of the jumpers on the board. The truth table of the function decoder is shown in Table 9-1.

D4	D5	HOST MUX	MUX-MUX	LSI-11
L	L	No Function	No Function	No Function
H	L	No Function	Host Mux Select	No Function
L	H	Host Select	Mux-Mux Select	Host Select
H	H	No Function	NO Function	LSI-11 Select

Table 9-1. Function Truth Table

9.4 Port Selector

The port selector is enabled by the host select function decoder (in a Host Multiplexer) or by the Mux-Mux select function decoder (in a Master Multiplexer). When the appropriate line is asserted in combination with the READY line being asserted, U17 will latch the contents of data lines 0-3. Data line 3 is not being used at the time of this writing but has been reserved for future applications. Data lines 0-2 are used to select the Multiplexer port to be enabled. The output lines of U17 enable the appropriate multiplexer/demultiplexer chips for the various signals.

9.5 Multiplexers and Demultiplexers

The Multiplexer must isolate the multiplexed drive bus from the demultiplexed port busses. It does so by the use of the multiplexers and demultiplexers for each of the control/acknowledge signals. The IC's which perform this function are U2, U6, U9, and U20. U2 multiplexes *STROBE, U6 demultiplexes READY, U9 demultiplexes the data enables for the bus drivers, and U20 multiplexes *MSYNC.

9.6 Bus Drivers

The Multiplexer uses bus drivers on all signals carried over the ribbon cable. This allows distances of up to 50 feet (15 meters) between the Multiplexer and the host device, and in a two-level network, up to 50 feet between the Master Multiplexer and each of the Host Multiplexers. Some driver functions are handled by the multiplexer and demultiplexer IC's themselves, such as with the signals *MSYNC and *STROBE. The READY signal has a separate driver chip U7. Since the data bus is a shared bus, the data bus for each port must be individually buffered to prevent one host from interfering with another. This also provides some noise immunity, since the drivers will isolate the data lines from each port. U1, U4, U5, U8, U10, U13, U15, and U18 are all bi-directional, tri-state drivers which are used to buffer the data lines.

9.7 Network Management Software

Below is a brief description of the network management software, 'Constellation.'

9.7.1 Volume Manager

This program allows the system manager to create and maintain volumes on the network.

9.7.2 User Manager

This program is used to create and maintain users on the network and control their access to information on the drive.

9.7.3 Constellation Manager

This allows the system manager to maintain the physical aspects of the network such as the Multiplexer Table, parameters, pipes, and semaphore tables.

9.7.4 Boot Manager

This program permits the system manager to write boot software to the disk for a particular type of computer. Each computer type must have its own boot software.

9.8 Boot Software

The boot software for individual computer systems will differ, some booting directly from the hard disk, others requiring a floppy to boot initially, then getting further boot software from the hard disk drive. Every system will check the volume access tables to determine to which volumes the user has access.

9.9 Pipes and Semaphores

Pipes and semaphores are special network utilities implemented to allow distributed process networks to share resources in a manner similar to mainframe systems, while still maintaining the cost and efficiency advantages of microcomputer networks.

Corvus supplies sample programs to allow users to implement simple tasks using pipes and semaphores. To make the best use of pipes and semaphores, it is recommended that the utilities be programmed to the specific user applications.

9.9.1 Pipes

Pipes are a method of communication on the network, which allow computers of like and unlike types to transmit information to each other. Corvus supplies a sample program called SPOOL which enables multiple systems to share the common resource of a printer. The source code is supplied, making custom applications much simpler.

9.9.2 Semaphores

Semaphores are a method of sharing common network resources without contention between users. Most microcomputer operating systems do not allow multi-user applications, making shared resources difficult if not impossible. By programming semaphores into the user application, resources such as common data files can be shared by multiple users with no fear of contention. Corvus supplies a sample program called SHARE in source code for programmers who wish to write their own applications.

CHAPTER 10
MULTIPLEXER TROUBLESHOOTING

CHAPTER 10

MULTIPLEXER TROUBLESHOOTING

10.1 Scope of Chapter

No diagnostic program is available for the Multiplexer. The following describes troubleshooting procedures to verify the hardware and software.

10.2 Introduction

Troubleshooting a Multiplexer network requires that the hardware and software be verified. Inspecting all hardware for correct installation is the first step.

10.3 Drive Switches

The first check should be the "MUX" switch on the front of the Corvus Drive. This switch should be set to the right when used in conjunction with a Multiplexer. With the exception of the LSI-11 switch set for use with LSI-11 computers, all other drive switches should be to the left.

10.4 Flat Cables

Check the installation of the flat cable. All connectors should be firmly seated. No segment of the flat cable should exceed 50 feet (15 meters). The flat cable which connects the drive to the Multiplexer should be 3 feet (1 meter). If a distance of greater than 50 feet is desired, a two-level network should be set up. The distance between the Master Multiplexer and the Host Multiplexer may be 50 feet; The length between the Host Multiplexer and the computer may be an additional 50 feet for a total distance of 100 feet (30 meters)

10.5 Multiplexer Table

In a two-level network, or a single-level network including LSI-11's, the Multiplexer Table should be checked to see that it accurately reflects the network topology. In a single-level network with no LSI-11's connected, all ports must be set to M, the default condition.

10.6 Polling Parameters

Verify that the polling parameters are set as shown in Table 8-4.

10.7 Multiplexer PCA

Verify that the jumper configuration on the Multiplexer PCA is set for the appropriate type of Multiplexer, see Tables 8-1 and 8-2.

Replacing the PCA with a known good one can immediately isolate a defective board possibly eliminating the need for additional troubleshooting.

When the Multiplexer has its own power supply, the voltage should be checked.

10.7.1 Metal Box

Most older Multiplexers, those in metal boxes will have the power wires soldered to the Multiplexer PCA. Multiplexers that have been returned for service may have the newer PCA.

1. Six allen-head screws on both sides of the Multiplexer secure the cover. Remove these screws and cover.
2. Check the voltage across the two terminals of the power supply. The reading should be 5 volts ± 0.1 volts. Adjustment to the power supply voltage is made by turning the 'V. ADJ' resistor at R6. See figure 4-1.

CAUTION:

Do not adjust the resistor at R4.

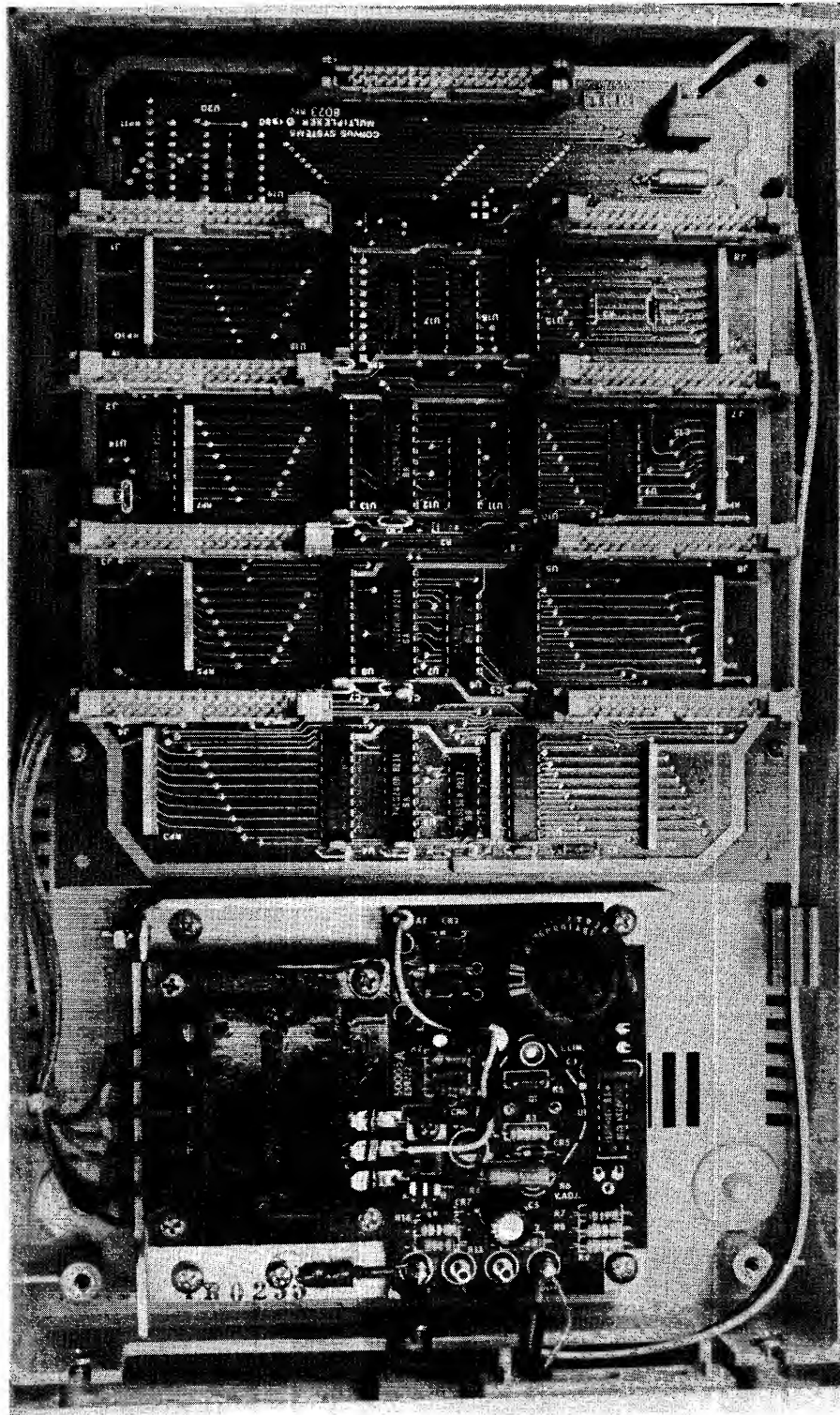


Figure 10-1 Multiplexer PCA and Power Supply

3. The voltage should then be measured on the Multiplexer PCA. This is done at the capacitor adjacent to the soldered power wires on the Multiplexer PCA.
4. If the voltage cannot be adjusted to within tolerance, the power supply should be replaced.

10.7.2 Foam Box

Multiplexers in the newer, foam boxes should have a Molex connector on the two power supply wires.

1. Remove the two screws from the rear of the Multiplexer which secure the cover.
2. Check the voltage across the two power supply terminals. The reading should be 5 volts \pm 0.10 volt.
3. If the power supply is not within specifications, the power supply is adjusted by turning the "V. ADJ" resistor at R6. See figure 4-1.

CAUTION:

Do not adjust the resistor at R4.

4. The power should also be checked at the Molex connector at J14 to verify continuity of the power wires and connector.
5. If the power supply cannot be adjusted within specifications, it must be replaced.

10.7.3 Multiplexers with No Power Supply

Early Multiplexers did not have their own power supply but received power from the disk drive. See the appropriate drive Service Manual for instructions on adjusting the drive power supplies.

10.8 Disk Drive

Next check the drive itself. See the appropriate drive Service Manual for instructions on adjusting the power supplies. Also check the backplane wiring of the drive.

10.9 Removal of Network Devices

Remove all network devices and reconnect them one at a time, verifying network operation each time. On a two-level network, be sure to change the Multiplexer Table to reflect any "Host" changes.

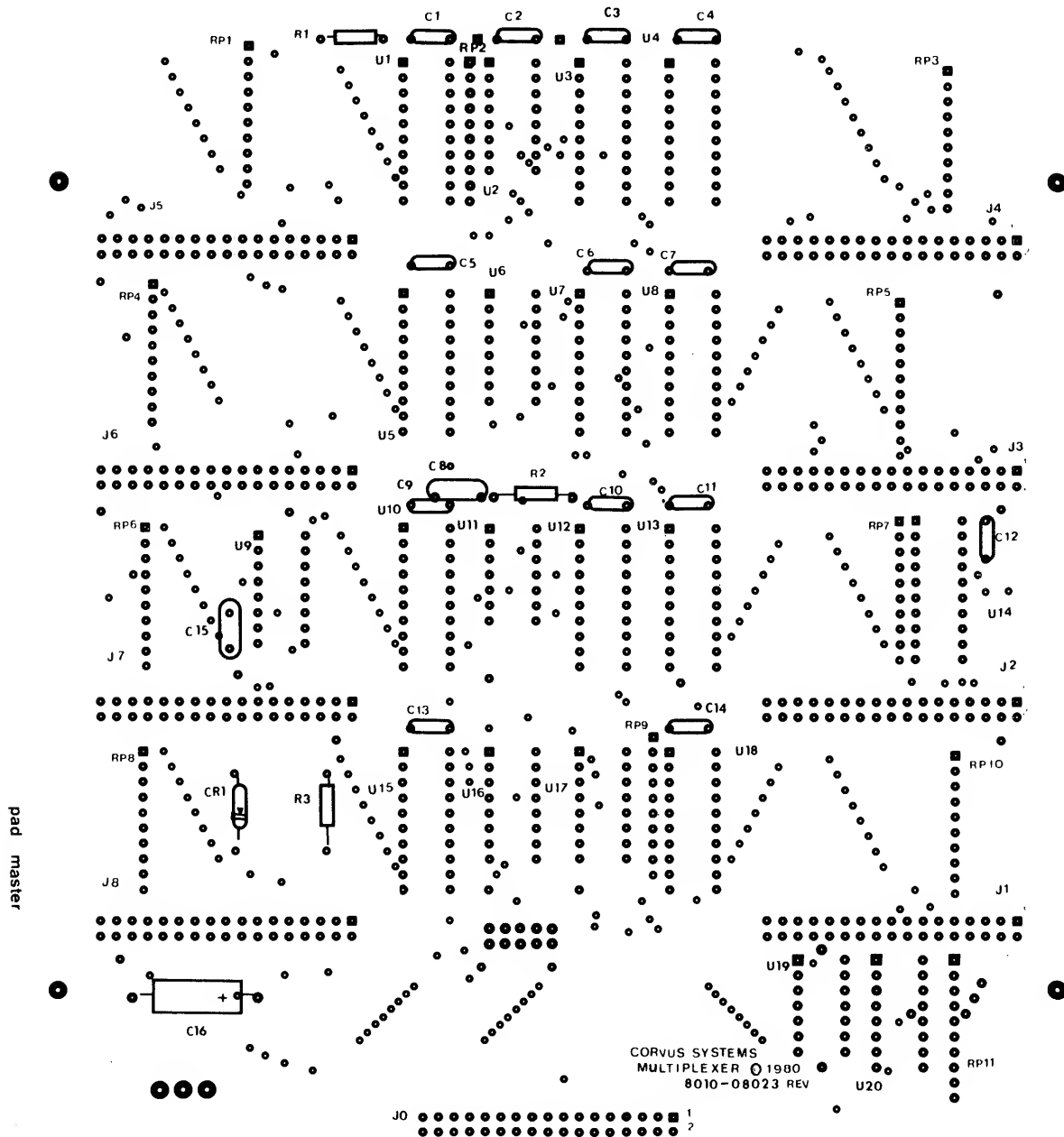


Figure 10-2. Multiplexer PCA

APPENDIX A
GLOSSARY

APPENDIX A

GLOSSARY

ACKNOWLEDGEMENT: A message which is sent to a transmitting host by the receiving host to indicate that the data was received correctly.

ACTIVE JUNCTION BOX: A signal amplifier used every 1000 feet (330 meters) of network trunk to extend the maximum trunk length to 4000 feet (1220 meters).

BUFFER: Temporary storage used to compensate for a difference in the rate of data flow or time of event occurrence.

CORCOM: The rear bezel unit which accepts the power cord, and contains the line filter, line voltage PCA, and fuse.

COMMAND VECTOR: Also called Control Block, the set of instructions in host memory which contain the information necessary for execution of a particular command by the transporter.

CONSTELLATION: The original name of the Corvus Multiplexer. Constellation now refers to the network management software used for OMNINET or the Multiplexer.

DIP SWITCH: DIP is the abbreviation for Dual-In-line Packaging. These two-position switches are used to set host addresses and other parameters for Corvus equipment.

DIRECT MEMORY ACCESS (DMA): The ability to read or write data to a disk without involving the Central Processing Unit (CPU). In a network environment, the Transporter takes temporary control of the host memory address lines and directly reads or writes to a location in host memory without host (microprocessor) intervention.

HEADER: A record of data which precedes the data being sent. The header contains information about the packet to be transmitted.

HOST: A computer or intelligent peripheral device attached to the network via a Transporter.

MICROSWITCH: See DIP SWITCH

MOLEX CONNECTOR: The type of connector used to connect the tap cable to the Disk Server. A different Molex connector connects the power supply to the PCA on some Multiplexers and Disk Servers.

NEGATIVE ACKNOWLEDGEMENT: A message sent to a transmitting host by the receiving host to indicate that the data was not correctly received. Different NAK values represent different errors.

NETWORK TAP: The connection between a network device and the OMNINET trunk line.

NODE: The combination of a host device and Transporter attached to the OMNINET trunk.

PACKET: A unit of information passed from one Transporter to another Transporter. There are several types of packets, including a message packet which contains a single host message. A packet will include a header, data, and other overhead information.

POLLING PARAMETERS: Data which describes the manner that sampling of host devices on a Multiplexer network is conducted. These parameters include how much time is allotted for a transmission by a device.

PROTOCOL: A set of rules and procedures for network communication. Different applications require different protocol.

RESULT RECORD or RESULT VECTOR: The location in host memory where user control and other command status information is stored.

RETURN CODE: Also called Status Byte, the first byte of the Result Record. It indicates command execution status.

ROUND-ROBIN POLLING: Sequential inquiries to each device on the Multiplexer to determine when communication is desired.

CORVUS DEALER SERVICE

SOCKET: A location in Transporter memory containing pointers and instructions about receiving or sending a packet. A message packet must be addressed to a particular socket.

TRANSPORTER: The Corvus controller hardware that interfaces a host device to the OMNINET network. The Disk Server acts as the Transporter for the disk drive.

APPENDIX B
OMNINET DRAWINGS AND SCHEMATICS

**OMNINET DISK SERVER FINAL ASSEMBLY
FOAM CABINET—8005-08601**

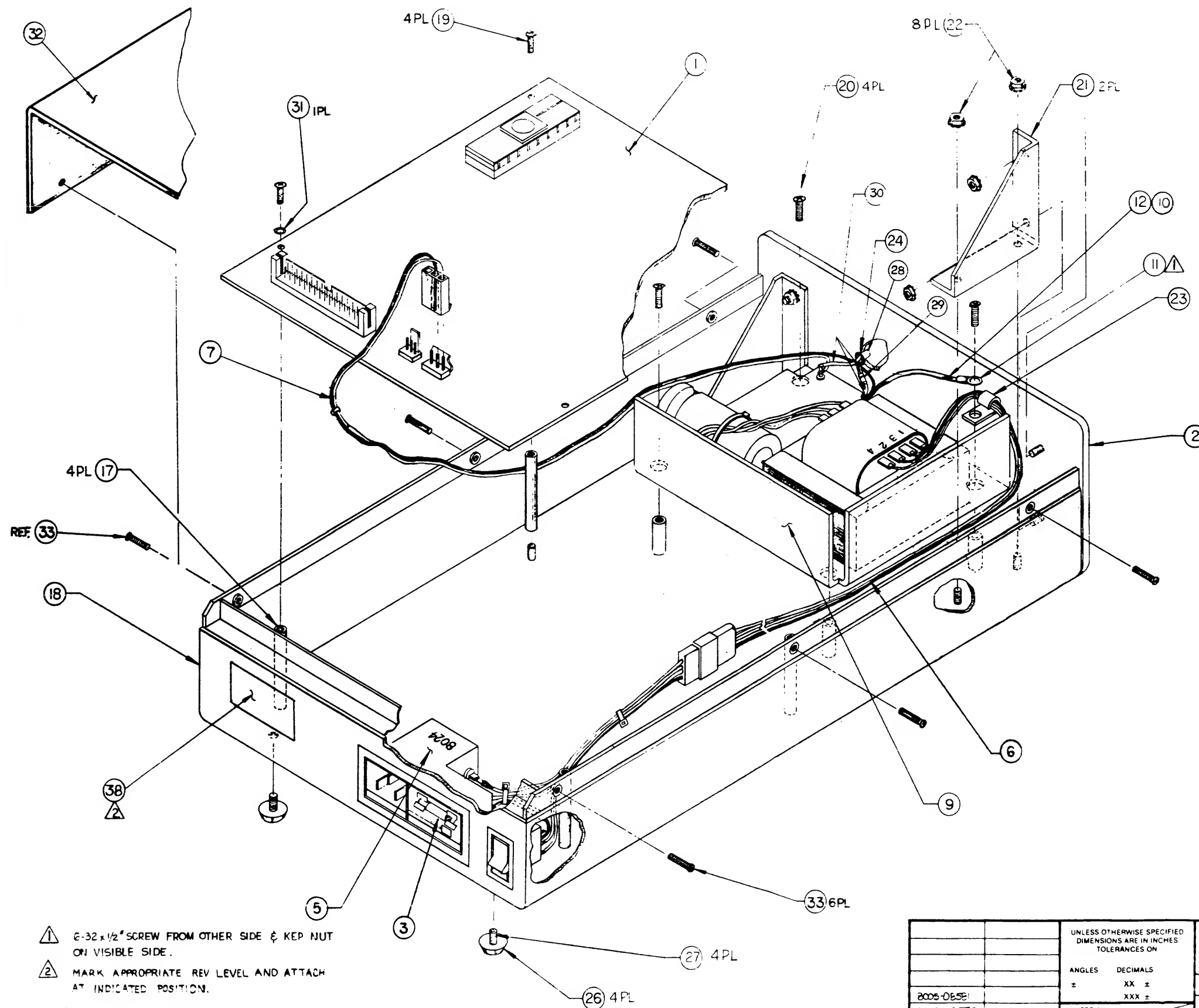
ID	PART NUMBER	DESCRIPTION	QTY*
1	3100-01645	PANEL BOTTOM FOAM	1
2	3100-01643	BEZEL FRONT FOAM	1
3	3100-01644	PANEL BACK MUX/OMNI FOAM	1
4	2800-02703	SCR #X ³ / ₈ PH PNHD S/TAP ZC 'F' PT	5
5	8010-08514	UNIVERSAL AC HARNESS	1
6	5100-02420	SWITCH 6A RKR SNAP IN DPST BLACK	1
7	8010-08629	POWER SUPPLY HB-5	1
8	2800-02765	SCR 8-32X ¹ / ₂ PH PNHD ZC W/EXT LCKWSH	4
9	2500-02846	LBL UL/CSA	1
10	2850-04734	SUPPORT BOARD .87 8-32 FLAME RT NYLON	4
11	8010-08018	PCA DISK SERVER	1
12	3100-01646	COVER TOP UTILITY FOAM	1
13	2800-02678	SCR 8-32X ³ / ₈ PH PNHD ZC	2
14	2800-01015	HOLDER LED	1
15	1760-01969	OVERLAY FRONT PANEL DISK SERVER	1
16	5110-01362	FUSE ¹ / ₂ AMP 250V	2
17	2800-02664	SCR 6-32X ³ / ₈ PH PNHD ZC	1
18	2800-01188	KEPNUT 6-32	1
19	2800-02283	RUBBER FEET BUTTON BLK	4
20	2800-01450	CLAMP CABLE LOCK ADH	1
21	2500-02589	LBL FCC NON-COMPLIANCE	1
22	2500-02700	LBL SERIAL/NUMBER MODEL DISK SERVER	1
23	1400-02709	END CAPS PL UTILITY BOX	1 PR
24	1400-02712	BOX OUTER PL UTILITY	1
25	1400-02416	BAG PLASTIC 12"X18" 2M THK	1
31	2500-03007	LBLSERVICE PLASTIC BOX	1

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.

**OMNINET DISK SERVER FINAL ASSEMBLY
METAL CABINET—8005-08047**

ID	PART NUMBER	DESCRIPTION	QTY*
1	8010-08018	DISK SERVER PCA	1
2	8010-08030	FRONT PANEL OMNINET F/METAL UTLTY BOX	1
3	5110-01362	FUSE ½ AMP 250 V	1
5	8010-08069	AC POWER HARNESS	1
6	6000-02218	WIRE 22AWG BLK IRR 300V	1.75 FT
7	6000-02222	WIRE 22AWG WHT IRR 300V	1.63 FT
9	4000-01455	POWER SUPPLY HB-5	1
10	6000-01423	WIRE BUSS 20AWG SOLID	0.250 FT
11	2800-01118	LUG RING #8	1
12	6020-01210	TEFLON SLEEVE 20AWG CLR	4.0 FT
17	2850-01572	STANDOFF INTERM OMNI	4
18	2400-01576	BOTTOM PAN	1
19	2800-01161	SCR 4-40X5/16 PH PNHD	4
20	2800-02765	SCR 8-32X½ PH PNHD ZN W/EXT LCKWSH	4
21	2400-01570	OMNINET BRACKET	2
22	2800-01188	KEPNUT 6-32	8
23	2800-01449	CLIP WIRE HARNESS	1
24	2800-01015	LED HOLDER	1
26	2800-01024	FEET RUBBER BLK	4
27	2800-02663	SCR 6-32X5/16 PH PNHD ZC	4
28	4820-01347	RED LED	1
29	4720-01319	RES 1K ¼W 5 %	1
31	2800-01192	WASHER FLAT PLASTIC #4	1
32	2400-01574	COVER TOP UTILITY BOX METAL	1
33	2800-01175	SCR 6-32X5/16 BUT HD	6
34	6000-02225	WIRE 18AWG RED IRR 300V	0.790 FT
35	6000-02227	WIRE 18AWG YEL IRR 300V	0.750 FT
36	6000-02226	WIRE 18AWG ORN IRR 300V	0.730 FT
37	6000-02223	WIRE 18AWG BLK IRR 300V	0.700 FT
38	2500-02700	LBL SERIAL NUMBER/MODEL DISK SERVER	1

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.



PCO	REV	DESCRIPTION	DATE	APPROVED
264	A	REL. FOR FACD.		
284	B	ADD CAP		
DCR 065	B1	ADD ITEMS # 5, 34-37	4-5-82	
517	C	ADD/DEL ITEMS		
641	D	CHG DESCR. IN L.V. DATA		
739	E	CHG ITEM 26 (L.M.)	1-2-82	
819	F	LY CHG ONLY	2-1-82	
1071	G	CHG ITEM 1 (L.M.)	5-25-82	
1131	H	CHG ITEM 10 - OBS	6-2-83	

PIN # ON CONN.	WIRE COLOR	TO TRANSFORMER TERMINAL #
1	RED	4
2	ORANGE	3
3	YELLOW	2
4	BLACK	1

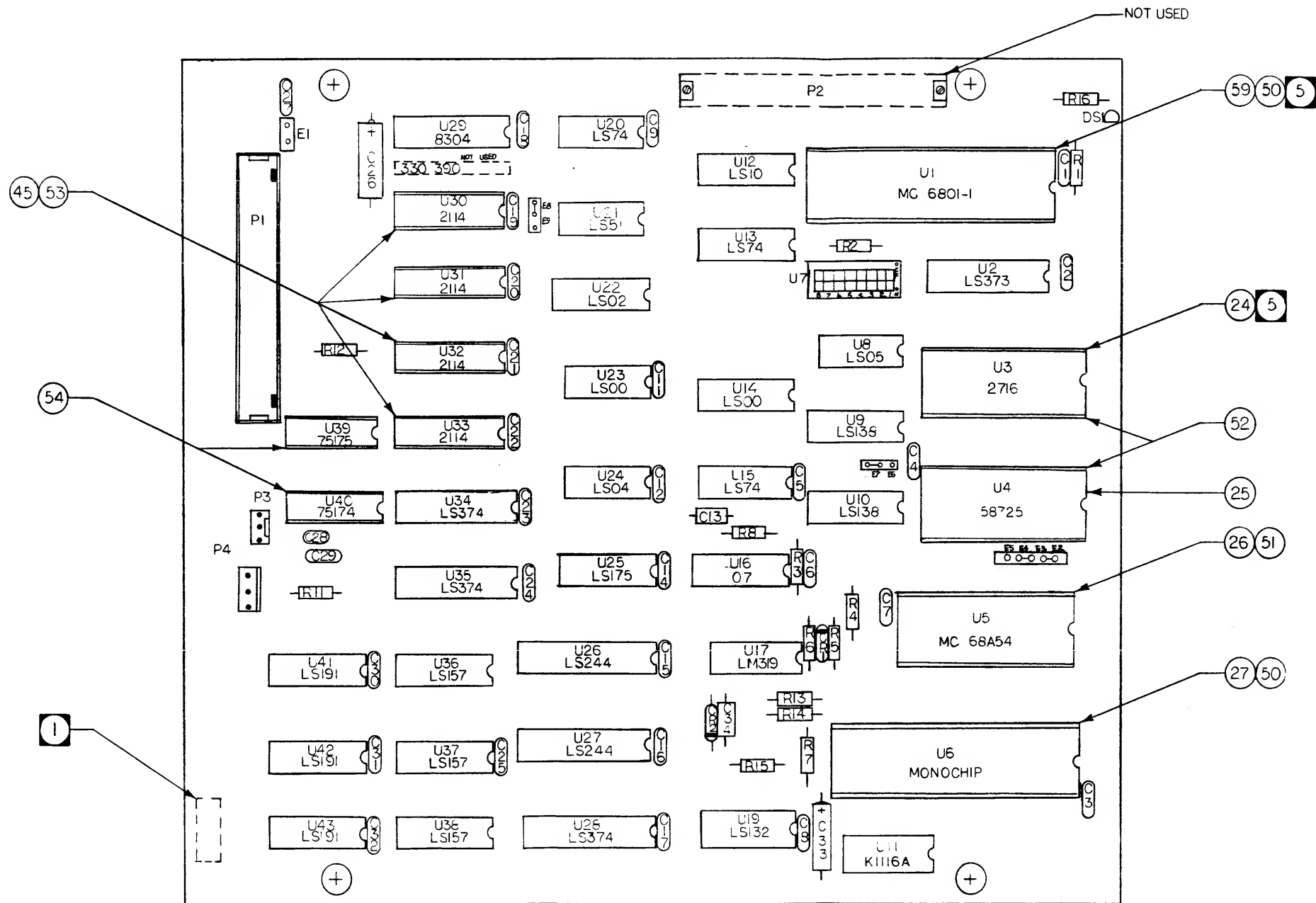
SEE P/L

- ⚠ 6-32 x 1/2" SCREW FROM OTHER SIDE & KEP NUT ON VISIBLE SIDE.
- ⚠ MARK APPROPRIATE REV LEVEL AND ATTACH AT INDICATED POSITION.

NOTE :

8005-06551 8000-09535 8000-2828 DSK SVR NEXT ASSY USED ON APPLICATION		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON ANGLES DECIMALS ± XX ± XXX ± MATERIAL FINISH	This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS DRAWN BY HUY DATE OF DRAWING 6-26-81 CHECKED BY S. J. J. ENGINEER APPROVED L. J. J. APPROVED	0580 6-2-83 CORVUS SYSTEMS 2029 O'Toole Avenue San Jose, CA 95131 DISC SERVER FINAL ASSY ASSY DRAWING 5-06047 SCALE
---	--	---	---	--

REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
1071	K	ADD 24-27,45,59;ADD NCTE 5	5-6-83	GKR
-	-	REDRAWN	5-27-83	GKR

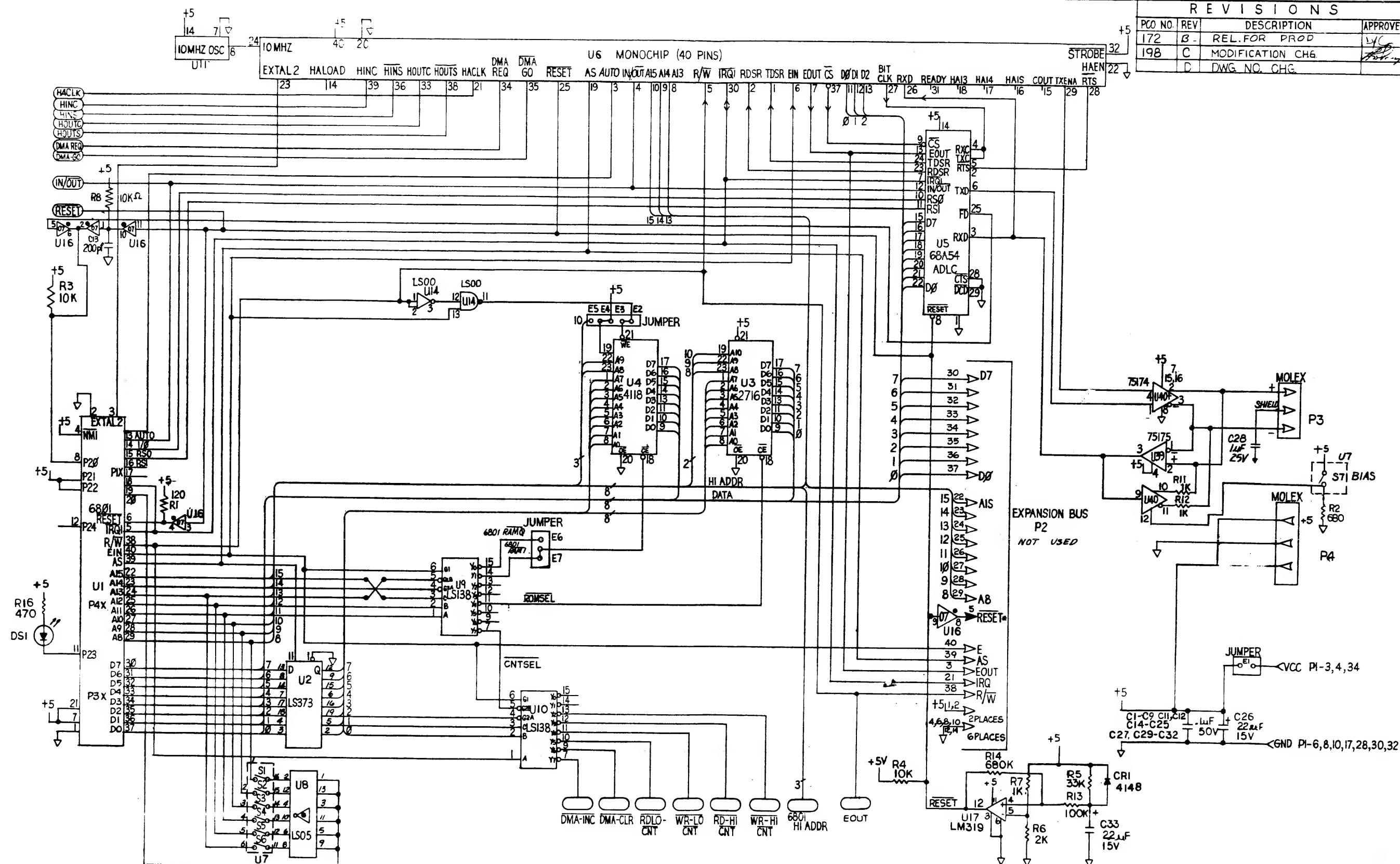


- 5 U1 AND U3 ARE TO BE PROGRAMMED PRIOR TO INSTALLATION AND AFTER ASSY IS WAVE-SOLDERED
- 4 DASH LINES REFER TO ITEMS NOT USED
- 3 NUMBER SHOWN FOR CLARITY ONLY. NO ASSY REQ'D. (FOR TEST ONLY.)
- 2 SQUARE PAD INDICATES PIN 1 OF IC.
- 1 PERMANENTLY MARK TO IDENTIFY REV. LEVEL APPROX. WHERE SHOWN.
- NOTES UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON		This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS.		CORVUS SYSTEMS 2029 O'Toole Avenue, San Jose, CA 95131	
ANGLES	DECIMALS	DRAWN BY EIDE GROOT		DATE OF DRAWING 6-4-83	
±	.XX ± .XXX ±	CHECKED BY		ENGINEER	
MATERIAL		APPROVED		APPROVED	
FINISH		APPROVED		APPROVED	
APPLICATION		APPROVED		APPROVED	
NEXT ASSY		USED ON		SCALE 2"	
6005-0804		6005-0805		6005-0806	
6005-0807		6005-0808		6005-0809	
6005-0810		6005-0811		6005-0812	
6005-0813		6005-0814		6005-0815	
6005-0816		6005-0817		6005-0818	
6005-0819		6005-0820		6005-0821	
6005-0822		6005-0823		6005-0824	
6005-0825		6005-0826		6005-0827	
6005-0828		6005-0829		6005-0830	
6005-0831		6005-0832		6005-0833	
6005-0834		6005-0835		6005-0836	
6005-0837		6005-0838		6005-0839	
6005-0840		6005-0841		6005-0842	
6005-0843		6005-0844		6005-0845	
6005-0846		6005-0847		6005-0848	
6005-0849		6005-0850		6005-0851	
6005-0852		6005-0853		6005-0854	
6005-0855		6005-0856		6005-0857	
6005-0858		6005-0859		6005-0860	
6005-0861		6005-0862		6005-0863	
6005-0864		6005-0865		6005-0866	
6005-0867		6005-0868		6005-0869	
6005-0870		6005-0871		6005-0872	
6005-0873		6005-0874		6005-0875	
6005-0876		6005-0877		6005-0878	
6005-0879		6005-0880		6005-0881	
6005-0882		6005-0883		6005-0884	
6005-0885		6005-0886		6005-0887	
6005-0888		6005-0889		6005-0890	
6005-0891		6005-0892		6005-0893	
6005-0894		6005-0895		6005-0896	
6005-0897		6005-0898		6005-0899	
6005-0900		6005-0901		6005-0902	
6005-0903		6005-0904		6005-0905	
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6005-0939		6005-0940		6005-0941	
6005-0942		6005-0943		6005-0944	
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REVISIONS

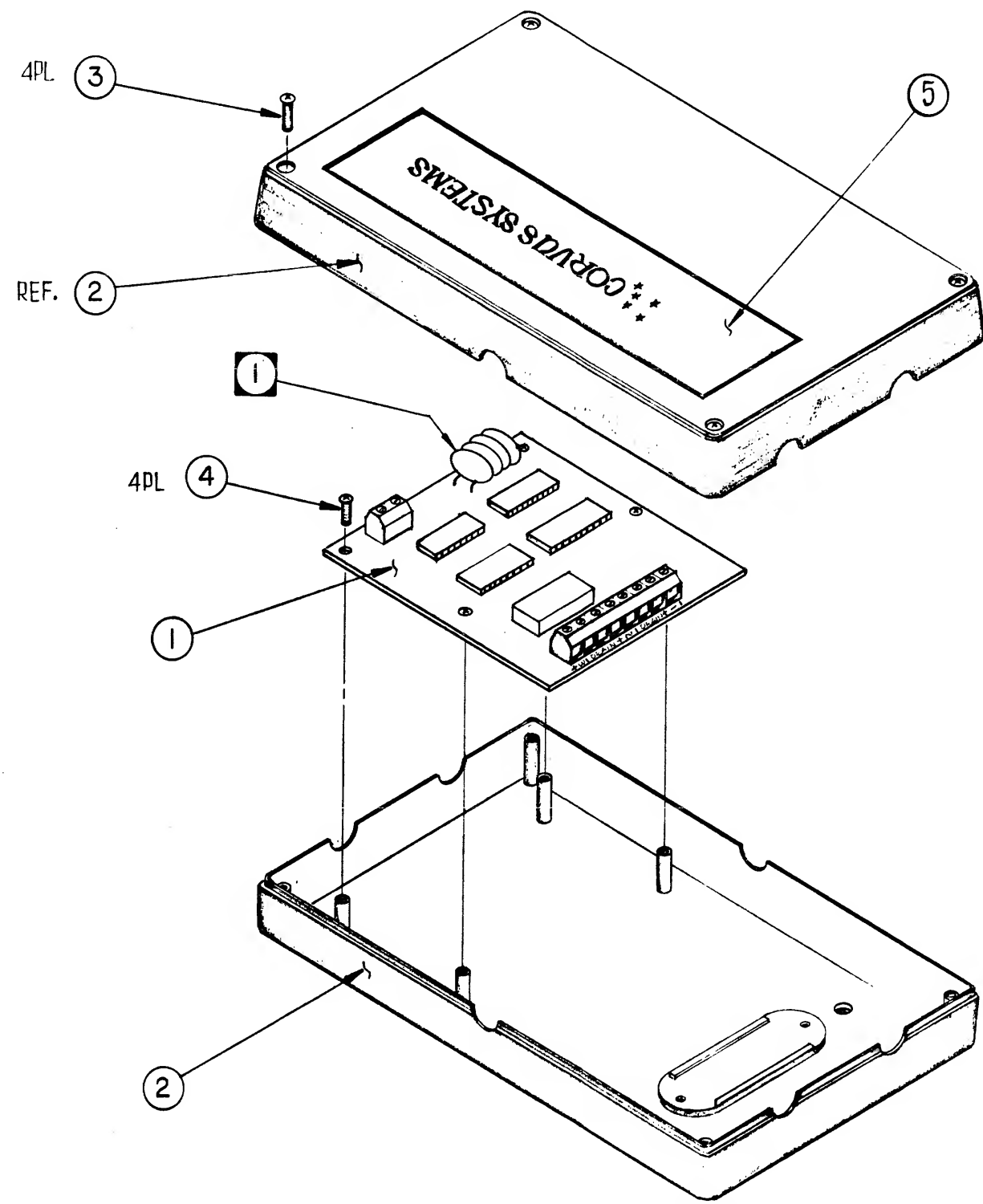
PCO NO.	REV	DESCRIPTION	APPROVED	DATE
172	B	REL. FOR PROD	LYC	2/6/81
198	C	MODIFICATION CHG.		7-22-81
	D	DWG. NO. CHG.		11-2-81



- NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL CAPACITANCE VALUE IN MICROFARAD
 2. ALL RESISTANCE VALUE IN OHMS 1/4, 5%

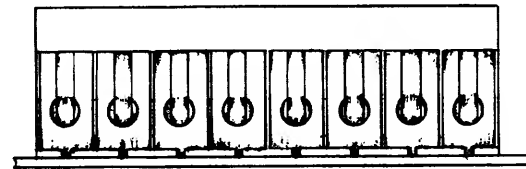
NOT USED	LAST USED	CORVUS SYSTEMS, INC.		
R10, 9	C34	SCALE: 1/8" = 1"	APPROVED BY: CKD	DRAWN BY: JORDON
P2	CR2	DATE: 6-81	DATE: 6-81	REVIEW: 0
U18, 7	DS1	PCA OMNINET DISC SERVEP		
C10	P4	SCHEMATIC DIAGRAM: 172-01796		
	R16	SHEET 1 OF 2		
	U43			

REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
446	A	REL FOR PROD.	6-28-82	<i>[Signature]</i>



1 ATTACH PCA TO BOX THEN FOLD CAPACITORS OVER SCREW AS SHOWN.
 NOTE :

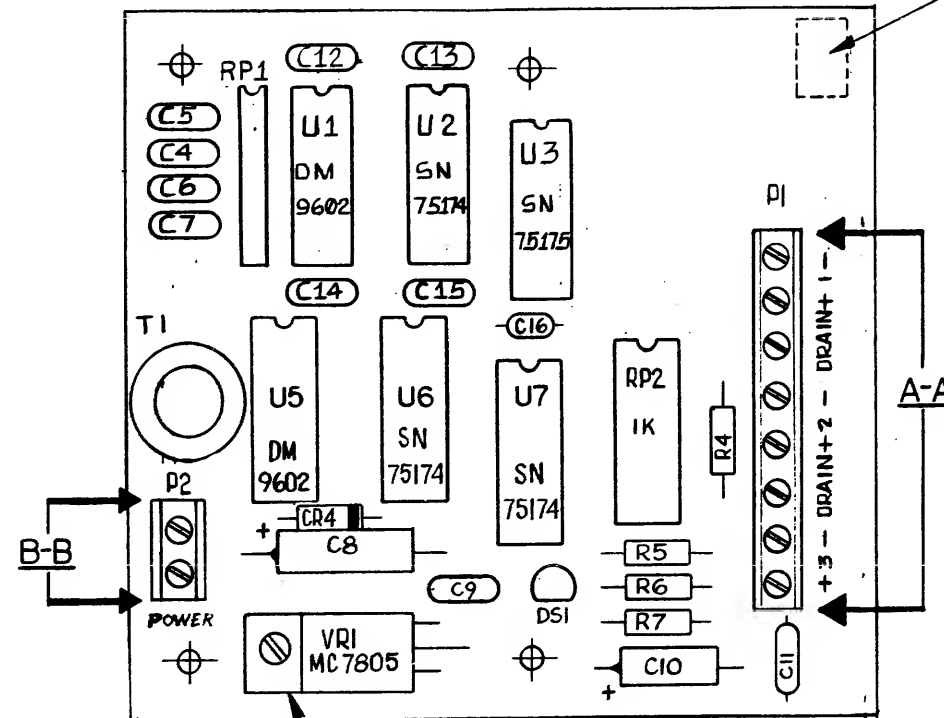
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON	This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS.		★★ CORVUS SYSTEMS ★★ 2029 O'Toole Avenue, San Jose, CA 95131	
					ACTIVE JUNCTION TOP ASSEMBLY	
		ANGLES DECIMALS ± .XX ±. .XXX ±.	DRAWN BY H. BUI	DATE OF DRAWING 6-9-82	ASSEMBLY DWG 8005-08686	
		MATERIAL	CHECKED BY L. FROHMAN	ENGINEER L. FROHMAN		
N/A N/A		FINISH	APPROVED		SCALE NONE SHEET 1 OF 1	
NEXT ASSY USED ON			APPROVED			
APPLICATION						



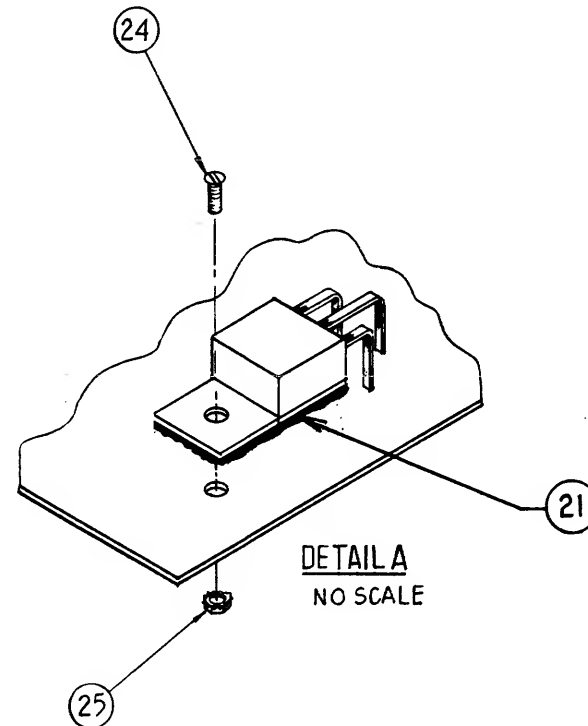
SECTION A-A
NO SCALE



SECTION B-B
NO SCALE



DETAIL A



DETAIL A
NO SCALE

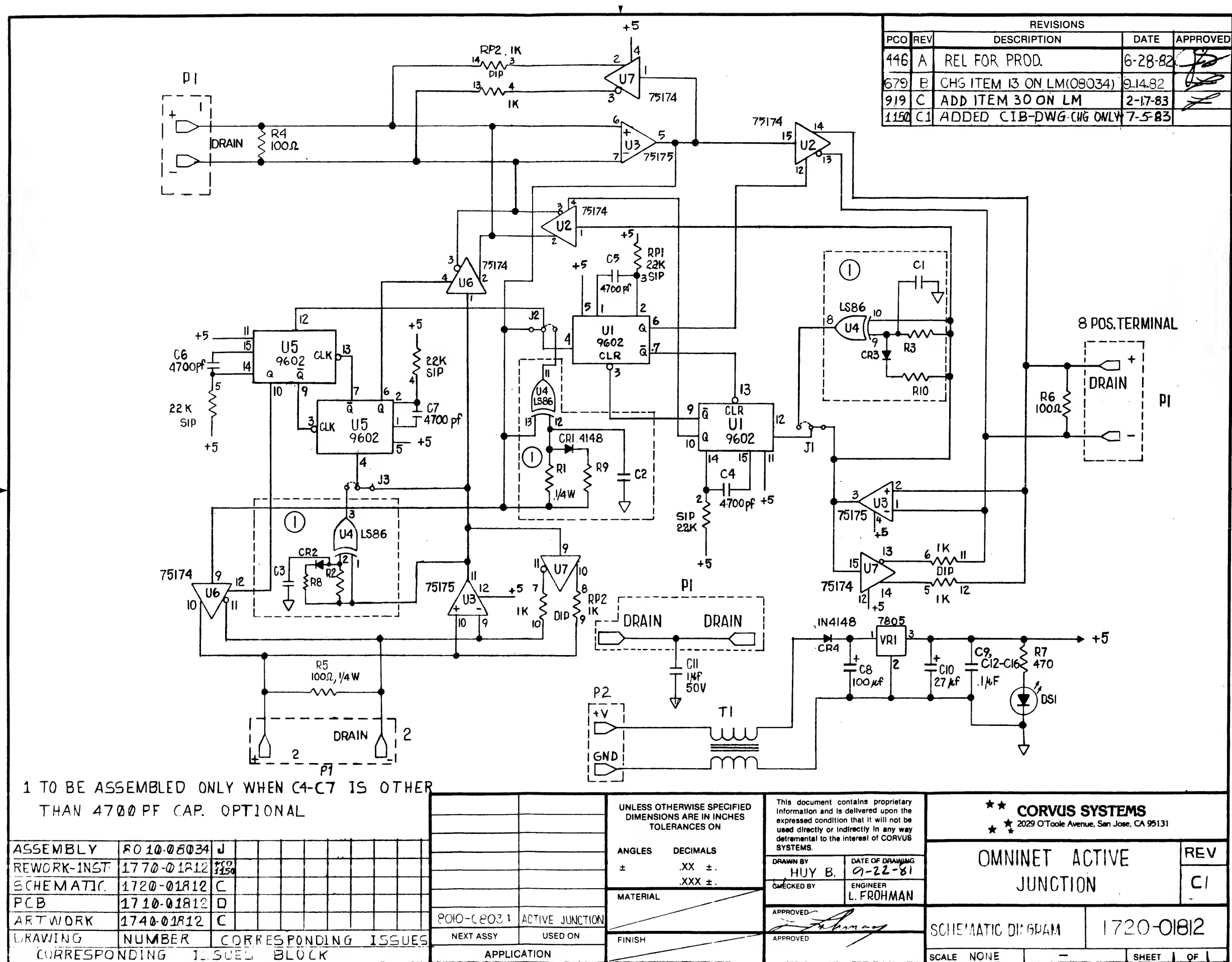
CORRESPONDING ISSUES BLOCK										REVISIONS			
DRAWING	NUMBER	CORRESPONDING	ISSUES	PCO	REV	DESCRIPTION	DATE	APPROVED					
ARTWORK	1740-01812	C				REL FOR PROD.	6-28-82						
PCB	1710-01812	D				CAP CHG-ITEM 7	9-9-82						
SCHEMATIC	1720-01812	C				CHG ITEM 13 ON LM (08034)	9-14-82						
REWORK INST	1770-01812	C				ADD ITEMS TO LM	10-13-82						
ASSEMBLY	8010-08034	J				CHG. ITEM 3 (LM CHG ONLY)	10-25-82						
						ARTWORK CHG (PCB)	11-3-82						
						ADD REF DES. (ITEM 3 & 4 ON LM)	12-3-82						
						ADD ITEM 30 ON LM	2-17-83						
						ENG CHG	7-5-83						

2. SQUARE PAD INDICATES PIN 1 IC,
CATHODE END OF DIODE, PIN 1 OF R-PAK,
POSITIVE END OF CAPACITOR.

1. PERMANENTLY MARK OR IDENTIFY REV
LEVEL APPROX WHERE SHOWN.

NOTES: UNLESS OTHERWISE SPECIFIED

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON		This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS		★ ★ CORVUS SYSTEMS ★ ★ 2029 O'Toole Avenue, San Jose, CA 95131	
		ANGLES DECIMALS ± .XX ± .XXX ±		DRAWN BY HUY B.		DATE OF DRAWING 11-12-81	
		MATERIAL		CHECKED BY L. Frohman		ENGINEER	
		FINISH		APPROVED L. Frohman		APPROVED	
8005-08636 DMN ACT JUNCT						OMNINET ACTIVE JUNCTION	
NEXT ASSY USED ON						ASSY DRAWING 8010-08034	
APPLICATION						SCALE NONE SHEET 1 OF 1	



APPENDIX C
UTILITY SERVER DRAWINGS AND SCHEMATICS

WIRE HOOK-UP CHART	
COLOR	TO
BLU	SWI-2
YEL	SWI-1
GRN	LF-GND

100 VAC

WIRE HOOK-UP CHART	
COLOR	TO
YEL	SWI-2
BRN	SWI-1
GRN	LF-GND

220 VAC

WIRE HOOK-UP CHART	
COLOR	TO
BRN	SWI-1
RED	SWI-2
GRN	LF-GND

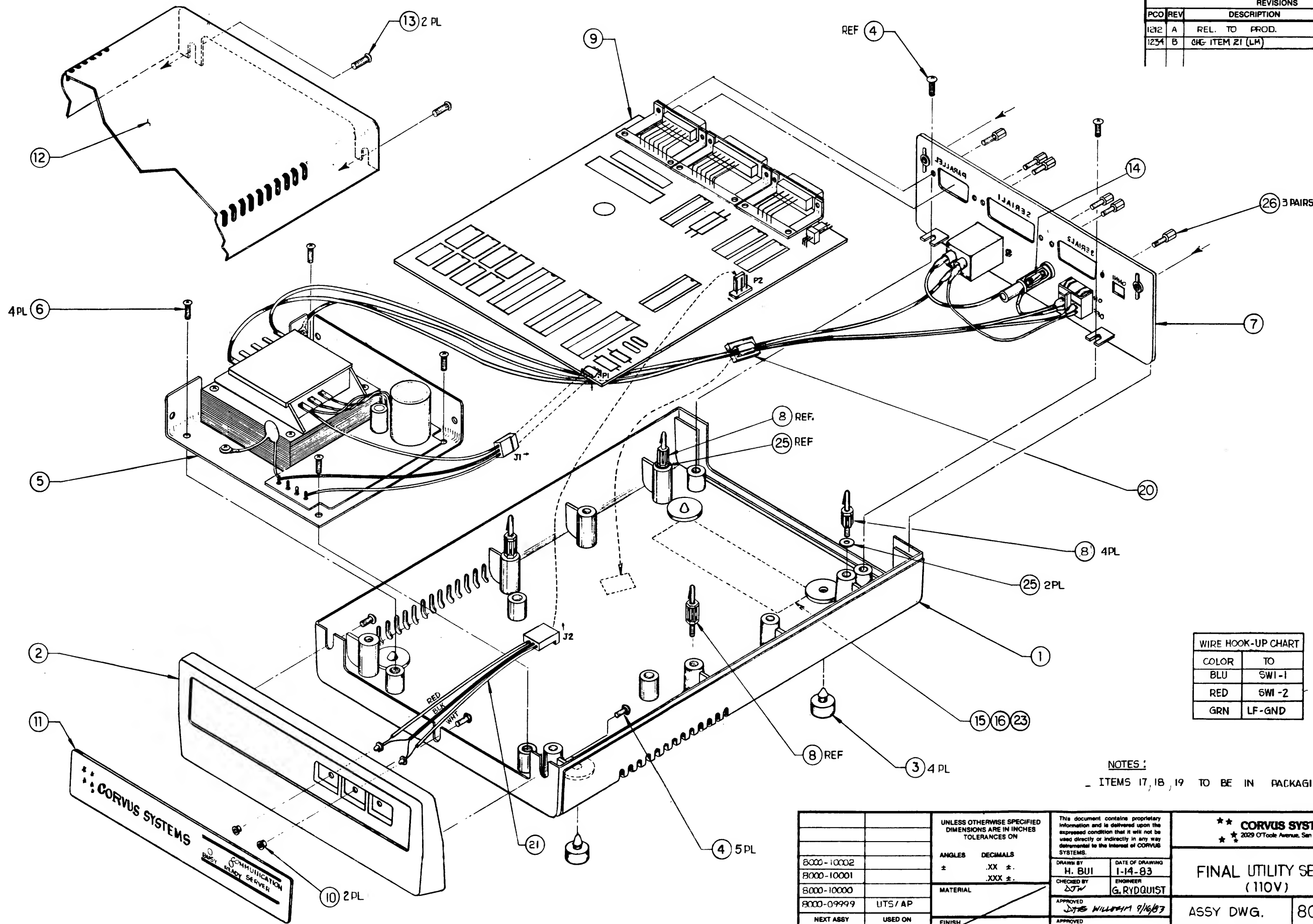
240 VAC

UTILITY SERVER FINAL ASSEMBLY
110 VOLTS—8005-09520

ID	PART NUMBER	DESCRIPTION	QTY*
1	3100-01645	PANEL BOTTOM UTILITY FOAM	1
2	3100-01643	BEZEL FRONT UTILITY FOAM	1
3	2800-02283	FEET BUTTON TYPE RUBBER BLK	4
4	2800-02703	SCR #8X ³ / ₈ PH PNHD S/TAP ZN 'F' PT	5
5	8010-09519	POWER SUPPLY UTILITY SERVER 110V	1
6	2800-02765	SCR 8-32X ¹ / ₂ " PH PNHD ZC W/EXT LCKWSH	4
7	8010-09525	REAR PANEL UTILITY SERVER	1
8	2800-01168	SPRT CI BD PLASTIC 50"	4
9	8010-09087	UTILITY SERVER PCA	1
10	2800-01015	LED HOLDER	2
11	1760-02899	FRONT OVERLAY PANEL	1
12	3100-01646	COVER TOP UTILITY FOAM	1
13	2800-02678	SCR 8-32X ³ / ₈ PH PNHD ZC	2
14	5110-01362	FUSE ¹ / ₂ AMP 250V	1
15	2500-03007	LBL SERVICE PLASTIC UTILITY BOX	1
16	2500-03155	SERIAL NUMBER MODEL UTILTY SERVER	1
17	1400-02709	END CAPS	1 PR
18	1400-02712	OUTER BOX	1
19	1400-02416	BAG PLASTIC 12"X18" 2M THK	1
20	2800-01450	CLAMP CABLE LOCK ADH	1
21	8010-09836	LED HARNESS	1
22	2500-03139	LBL SHIPPING	2
23	2500-02429	LBL FCC COMPLIANCE (1 ¹ / ₂ " X 5")	1
25	2800-01171	FLT LCKWSH #8 OD.375ID.174THK.032 ZN PLT	2
26	2800-02295	KIT JACKSOCKET ADI CONN	3

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.

REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
1212	A	REL. TO PROD.	9-16-83	H.B. DW
1234	B	CHG ITEM 21 (LM)	10-28-83	WLT



WIRE HOOK-UP CHART	
COLOR	TO
BLU	SW1-1
RED	SW1-2
GRN	LF-GND

NOTES:
 - ITEMS 17, 18, 19 TO BE IN PACKAGING ASSY DWG

8000-10002 8000-10001 8000-10000 8000-09999 NEXT ASSY APPLICATION		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON ANGLES DECIMALS ± .XX ± .XXX ± MATERIAL FINISH	This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS. DRAWN BY H. BUI CHECKED BY G. RYDQUIST APPROVED JTS WILLIAM 9/16/83 APPROVED	★★ CORVUS SYSTEMS ★★ 2029 O'Toole Avenue, San Jose, CA 95131 FINAL UTILITY SERVER (110V) ASSY DWG. 8005-09520 SCALE NTS SHEET 1 OF 1
8000-10002 8000-10001 8000-10000 8000-09999 NEXT ASSY APPLICATION		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON ANGLES DECIMALS ± .XX ± .XXX ± MATERIAL FINISH	This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS. DRAWN BY H. BUI CHECKED BY G. RYDQUIST APPROVED JTS WILLIAM 9/16/83 APPROVED	★★ CORVUS SYSTEMS ★★ 2029 O'Toole Avenue, San Jose, CA 95131 FINAL UTILITY SERVER (110V) ASSY DWG. 8005-09520 SCALE NTS SHEET 1 OF 1

**Utility Server Power Supply Assembly
8010-09519**

WIRE HOOK-UP CHART 100V							
ITEM#	AWG	COLOR	L	TO	NOTES	STRIP	GAP
6	18	BLU	13"	TERM # 1	DO NOT CUT JUMPERS	½"	¼"
5	18	YEL	13"	TERM # 5		½"	¼"
2	18	GRN	7"	P/S CHASSIS		¼"	¼"
15	18	BLK	—	— OUT	PART OF DC HARNESS	—	—
	18	WHT	—	+ OUT	PART OF DC HARNESS	—	—
	18	ORN	—	TERM A	PART OF DC HARNESS	—	—

ID	PART NUMBER	DESCRIPTION	QTY*
1	4000-01455	RWS POWER SUPPLY HB-5	1.000
2	6000-02228	WIRE 18AWG GRN IRR 300V	0.530 FT
3	2800-02331	TERM FAST ON .250X.032	1.000
4	2800-02090	TERM FAST ON .187X.032	2.000
5	6000-02225	WIRE 18AWG RED IRR 300V	1.080 FT
6	6000-02229	WIRE 18AWG BLU IRR 300V	1.080 FT
7	2800-01131	LUG RING #6	2.000
8	2800-02776	SCR 6-32X¾ PH SLF-TAP	1.000
12	6000-01423	WIRE BUSS 20AWG SOLID	0.100 FT
13	2800-02664	SCR 6-32X¾ PH PNHD ZC	1.000
14	2800-01188	KEPNUT 6-32	1.000
15	8010-09712	DC HARNESS FOR UTILITY SERVER	1.000

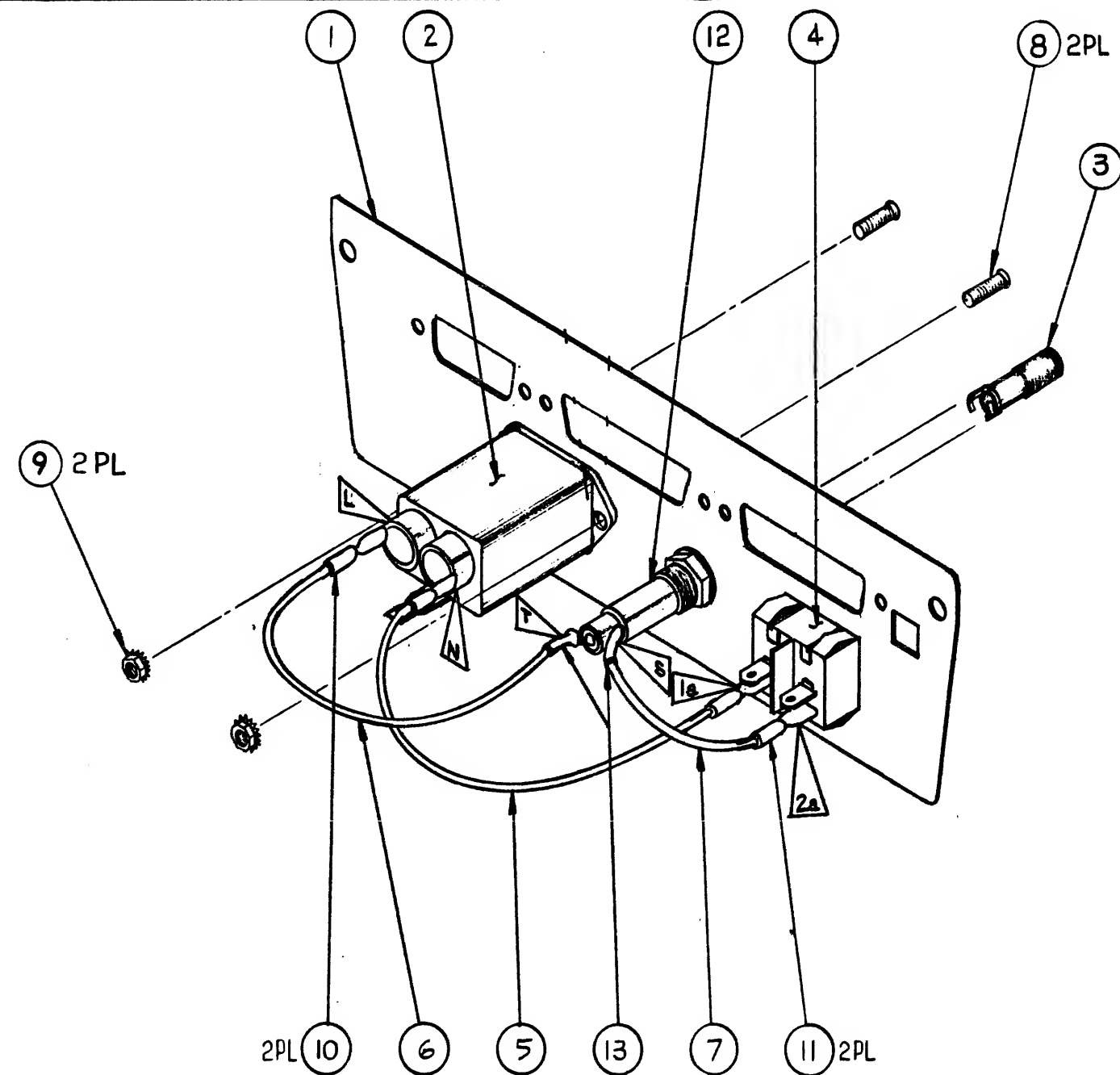
WIRE HOOK-UP CHART 220V					
ITEM#	AWG	COLOR	L	TO	NOTES
6	18	BRN	13"	TERM # 1	CUT EXISTING JUMPERS
5	18	YEL	13"	TERM # 5	ADD JUMPER BETWEEN 2-3
2	18	GRN	7"	P/S CHASSIS	
15	18	BLK	—	— OUT	PART OF DC HARNESS
	18	WHT	—	+ OUT	PART OF DC HARNESS
	18	ORN	—	TERM A	PART OF DC HARNESS

WIRE HOOK-UP CHART 240V.					
ITEM	AWG	COLOR	L	TO	NOTES
6	18	BRN	13"	TERM # 1	CUT EXISTING JUMPERS
5	18	RED	13"	TERM # 4	ADD JUMPER BETWEEN 2-3
2	18	GRN	7"	P/S CHASSIS	
15	18	BLK	—	—OUT	PART OF DC HARNESS
	18	WHT	—	+OUT	PART OF DC HARNESS
	18	ORN	—	TERM A	PART OF DC HARNESS

**REAR PANEL UTILITY SERVER ASSEMBLY
8010-09525**

ID	PART NUMBER	DESCRIPTION	QTY*
1	3150-03069	BACK PANEL	1
2	2100-02942	LN FLTR 115/250VAC 50-60HZ 6A ¼" ST-ON	1
3	2800-01106	FUSE HOLDER GRAY 3AWG	1
4	5100-02420	SWITCH 6A RKR SNAP IN DPST BLK	1
5	6000-02223	WIRE 18AWG BLK IRR 300V	0.500 FT
6	6000-02230	WIRE 18AWG VIO IRR 300V	0.290 FT
7	6000-02231	WIRE 18AWG WHT IRR 300V	0.210 FT
8	2800-02119	SCREW 4-40X7/16 BLK BUT HD	2
9	2800-01189	KEPNUT 4-40	2
10	2800-02331	TERM FAST-ON .250X.032	2
11	2800-02090	TERM FAST-ON .187X.032	2
12	2800-01105	FUSE HOLDER	1
13	6020-01204	SHRINK TUBING ⅛" BLK	1.0 FT

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.

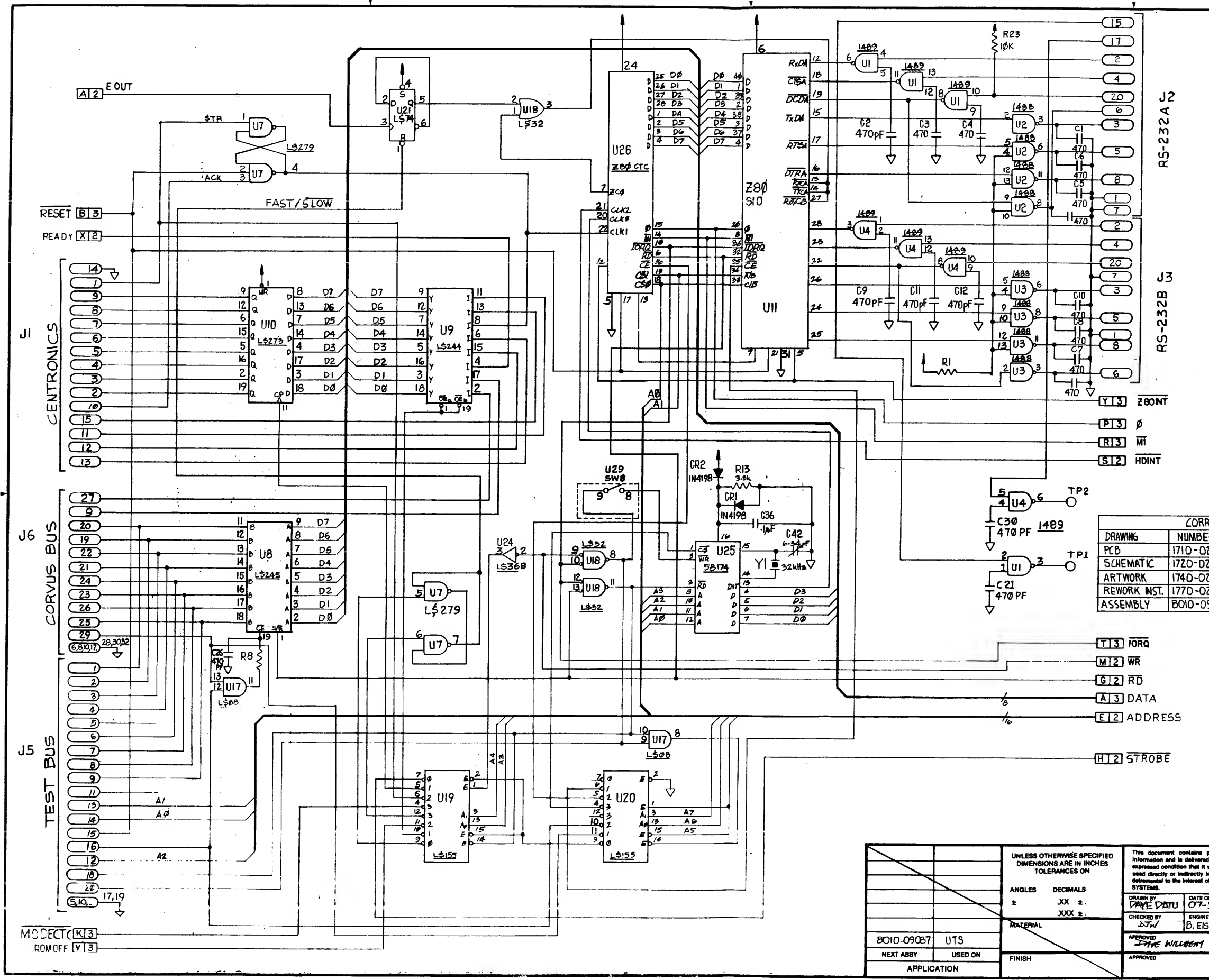


REVISIONS			
PCO	REV	DESCRIPTION	DATE
1212	A	RELEASE TO PROD.	8/16-83
			APPROVED H.B. <i>[Signature]</i>

WIRE PREP			
AWG	COLOR	LENGTH	NOTES
18	BLK	6"	STRIP ALL WIRES 1/4" BOTH ENDS
18	VIO	3.5"	
18	WH	2.5"	

WIRE CONNECTION CHART				
ITEM#	COLOR	FROM	TO	NOTES
5	BLK	SW-1a	LF-N	
6	VIO	FH-T	LF-L	ADD SHRINK TUBING ON FUSE HLDR
7	WHT	SW-2a	FH-S	

8005-09524 8006-09522 8008-09520 8005-09518 NEXT ASSY APPLICATION		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON ANGLES DECIMALS ± .XX ± .XXX ± MATERIAL FINISH	This document contains proprietary information and is delivered upon the expressed condition that it will not be used directly or indirectly in any way detrimental to the interest of CORVUS SYSTEMS. DRAWN BY DAVE DATU CHECKED BY [Signature] APPROVED DAVE WILLIAMS 9/16/83 APPROVED	★★ CORVUS SYSTEMS ★★ 2029 O'Toole Avenue, San Jose, CA 95131 TITLE REAR PANEL, UTILITY SERVER ASSY. DWG. SCALE NTS	REV A 8010-09525 SHEET 1 OF 1
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REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
1212	A	REL. TO PROD.	9-16-83	H.B. JTW

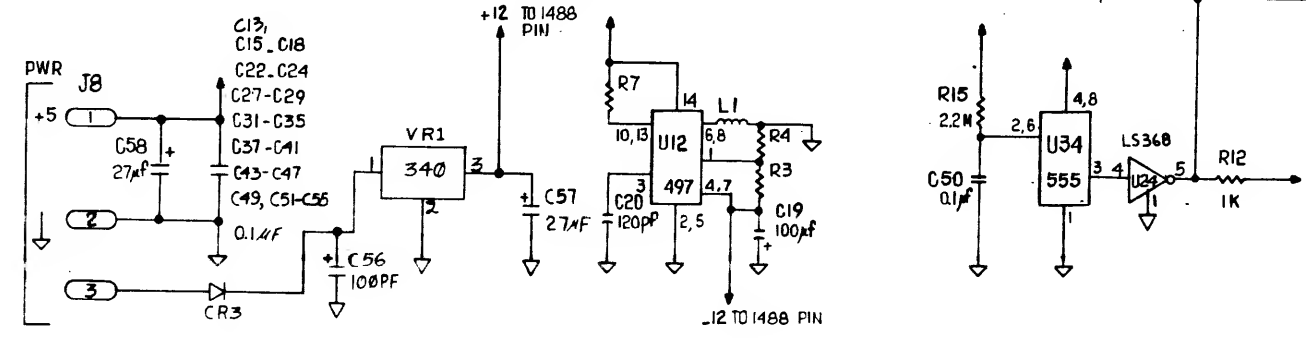
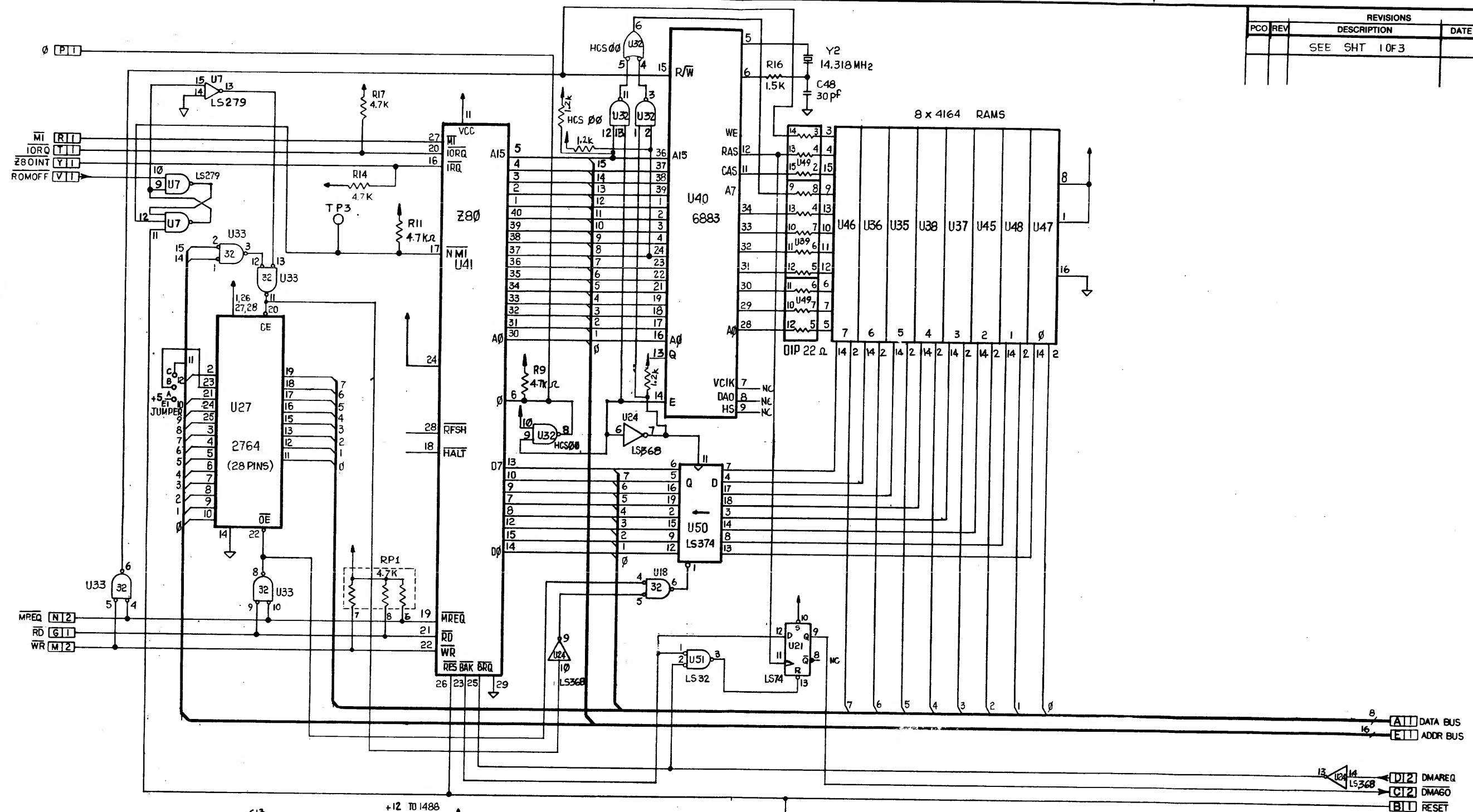
CORRESPONDING ISSUES BLOCK				
DRAWING	NUMBER	CORRESPONDING		
PCB	1710-02922	03	04	A
SCHEMATIC	1720-02922	03	04	A
ARTWORK	1740-02922	02	03	03
REWORK INST.	1770-02922	-	02	02
ASSEMBLY	8010-09087	03	04	A

2. ↑ DENOTES +5Vcc, ↓ DENOTES GND
TRACE CONN. (i.e. 'A' CONN TO 'A')
SHEET No. 1. [A3]

NOTES:

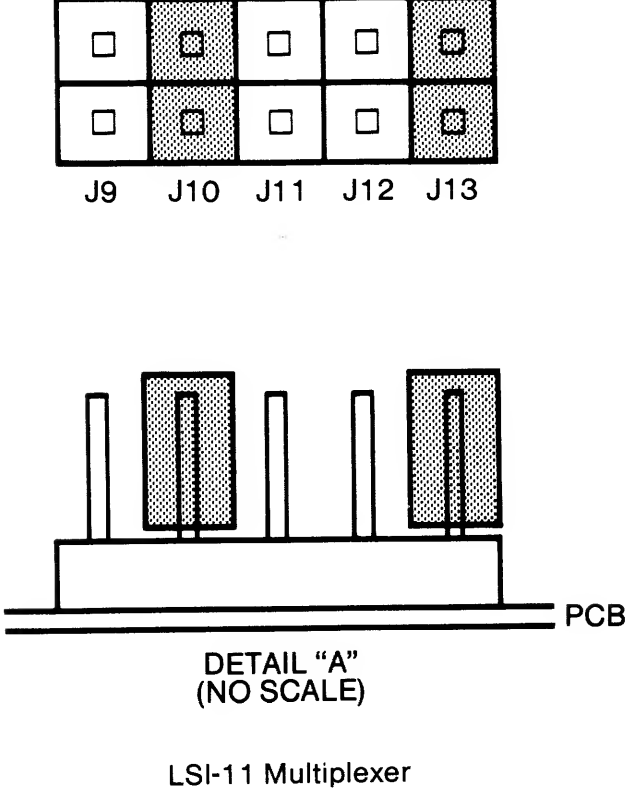
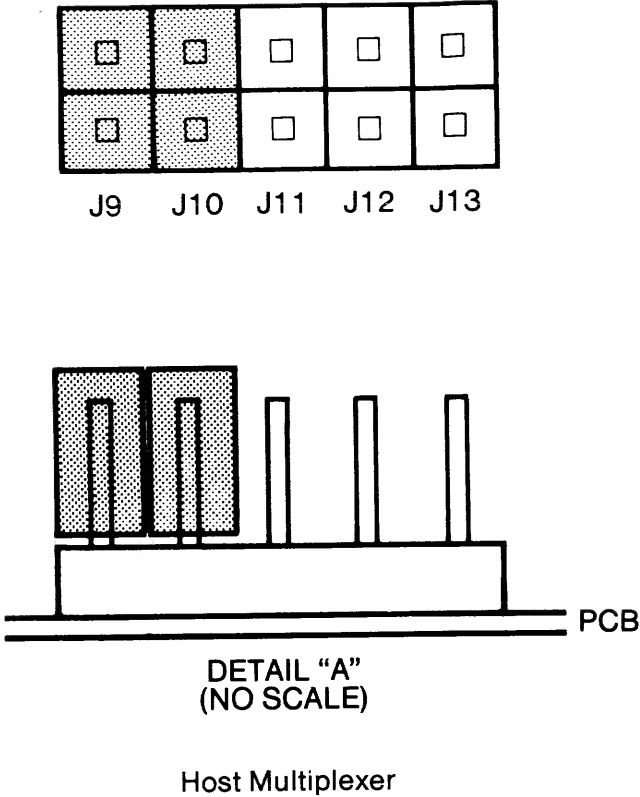
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ANGLES	DECIMALS	DRAWN BY	DATE OF DRAWING	UTILITY SERVER (I/O SECTION)	
±	.XX ±	DAVE DATU	07-30-82		
MATERIAL	.XXX ±	CHECKED BY	ENGINEER	SCHEM. DIAG. 1720-02922	
		JTW	B. EISENHARD		
BO10-09087	UTS	APPROVED	DAVE WILLIAMS 9/10/83	SCALE: NTS	
NEXT ASSY	USED ON	FINISH	APPROVED		
APPLICATION				SHEET 1 OF 3	

REVISIONS			
PCO	REV	DESCRIPTION	DATE
		SEE SHT 1 OF 3	



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ANGLES: .XX DECIMALS: .XXX	DRAWN BY: H. BUI DATE OF DRAWING: 7-29-82 CHECKED BY: B. EISENHARD ENGINEER		UTILITY SERVER (PROCESSOR)	
MATERIAL:	APPROVED:		SCHEMATIC DIAGRAM 1720-02922	
FINISH:	APPROVED:		SCALE: NTS SHEET 3 OF 3	

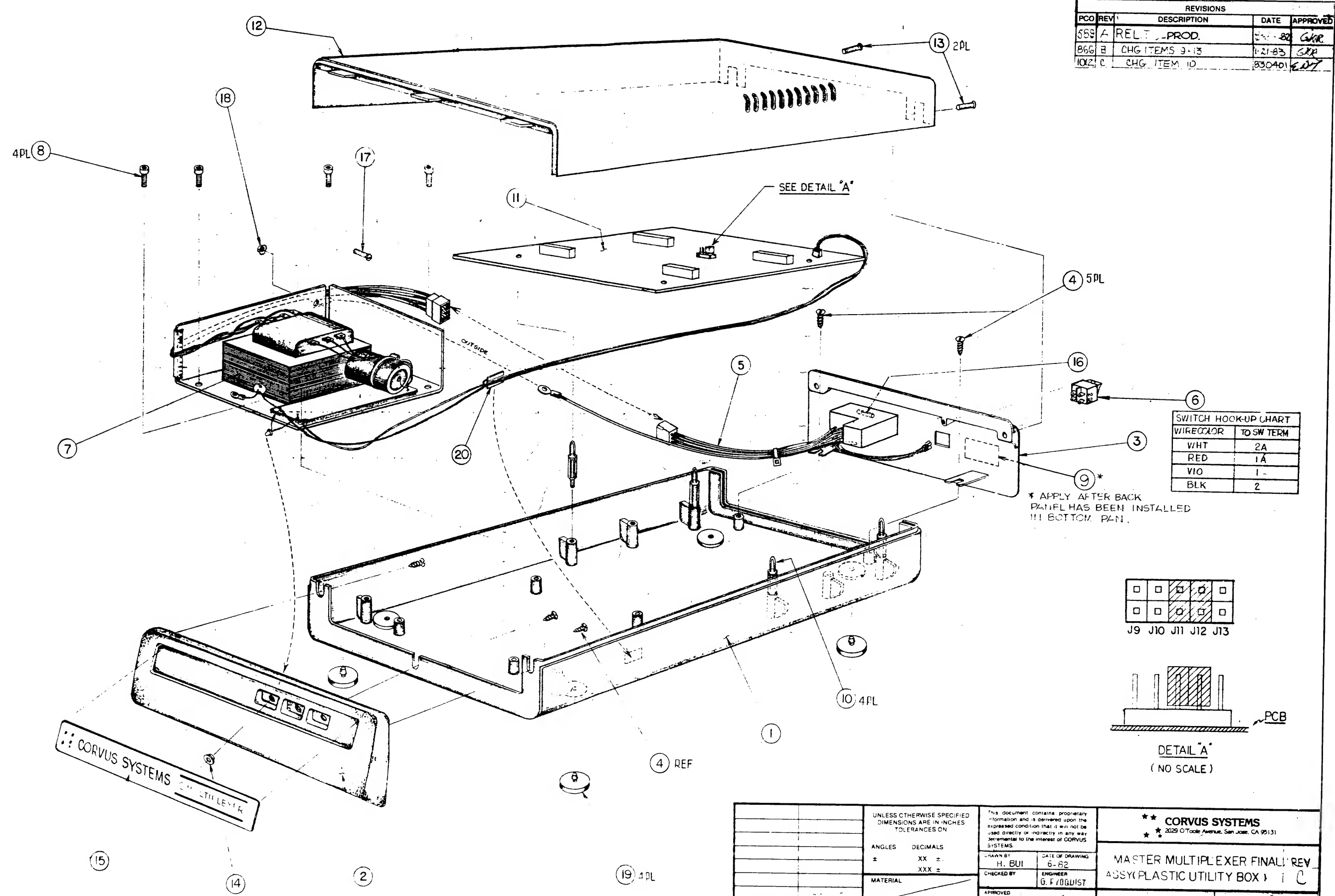
APPENDIX D
MULTIPLEXER DRAWINGS AND SCHEMATICS



MULTIPLEXER FINAL ASSEMBLY
FOAM CABINET—8005-08708

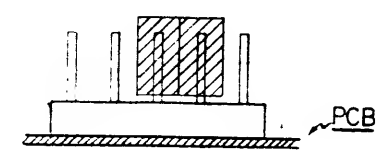
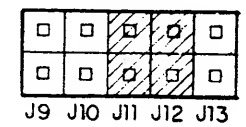
ID	PART NUMBER	DESCRIPTION	QTY*
1	3100-01645	PANEL BOTTOM UTILITY FOAM	1
2	3100-01643	BEZEL FRONT UTILITY FOAM	1
3	3100-01644	PANEL BACK MUX/OMNI FOAM	1
4	2800-02703	SCR #8X3/8" PH PNHD S/TAP ZC 'F' PT	5
5	8010-08514	UNIVERAL AC HARNESS	1
6	5100-02420	SWITCH 6A RKR SNAP-IN DPST BLK	1
7	8010-08629	POWER SUPPLY HB-5	1
8	2800-02765	SCR 8-32X1/2 PH PNHD AN W/EXT LCKWSH	4
9	2500-02846	LBL UL/CSA	1
10	2850-04734	BOARD SUPPORT .87 8-32 FLAME RT NYLON	4
11	8010-08023	MULTIPLEXER PCA	1
12	3100-01646	COVER TOP UTILITY FOAM	1
13	2800-02678	SCR 8-32X3/8 PH PNHD ZC	2
14	2800-01015	LED HOLDER	1
15	1760-01965	OVERLAY FRONT PANEL MULTIPLEXER	1
16	5110-01362	FUSE 1/2 AMP 250V	4
17	2800-02664	SCR 6-32X3/8 PH PNHD ZC	1
18	2800-01188	KEPNUT 6-32	1
19	2800-02283	FEET BUTTON TYPE RUBBER BLK	4
20	2800-01450	CLAMP CABLE LOCK ADH	1
21	2500-02589	LBL FCC NON-COMPLIANCE	1
22	1400-02712	BOX OUTER PL UTILITY	1
23	1400-02709	END CAPS PL UTILITY BOX	1 PR
24	1400-02416	BAG PLASTIC 12"X18" 2M THK	1
25	2500-02435	LBL SHIPPING MASTER MULTIPLEXER	1
26	2500-02699	LBL SERIAL NUMBER/MODEL MASTER MLTPLXR	1

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.



REVISIONS			
PCO	REV	DESCRIPTION	DATE
588	A	REL. PROD.	6-82
866	B	CHG ITEMS 9-13	1-21-83
102	C	CHG ITEM 10	830401

SWITCH HOOK-UP CHART	
WIRE COLOR	TO SW TERM
WHT	2A
RED	1A
VIO	1-
BLK	2



DETAIL "A"
(NO SCALE)

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		ANGLES DECIMALS ± XX ± XXX ±		DRAWN BY: H. BUI DATE OF DRAWING: 6-82 CHECKED BY: G. F. JOGQUIST APPROVED:	
MATERIAL:		FINISH:		MASTER MULTI-LEXER FINAL REV ASSY (PLASTIC UTILITY BOX)	
NEXT ASSY: USED ON: APPLICATION:		APPROVED:		ASSEMBLY DWG: 8005-08708	
SCALE: NONE				SHEET 1 OF 1	

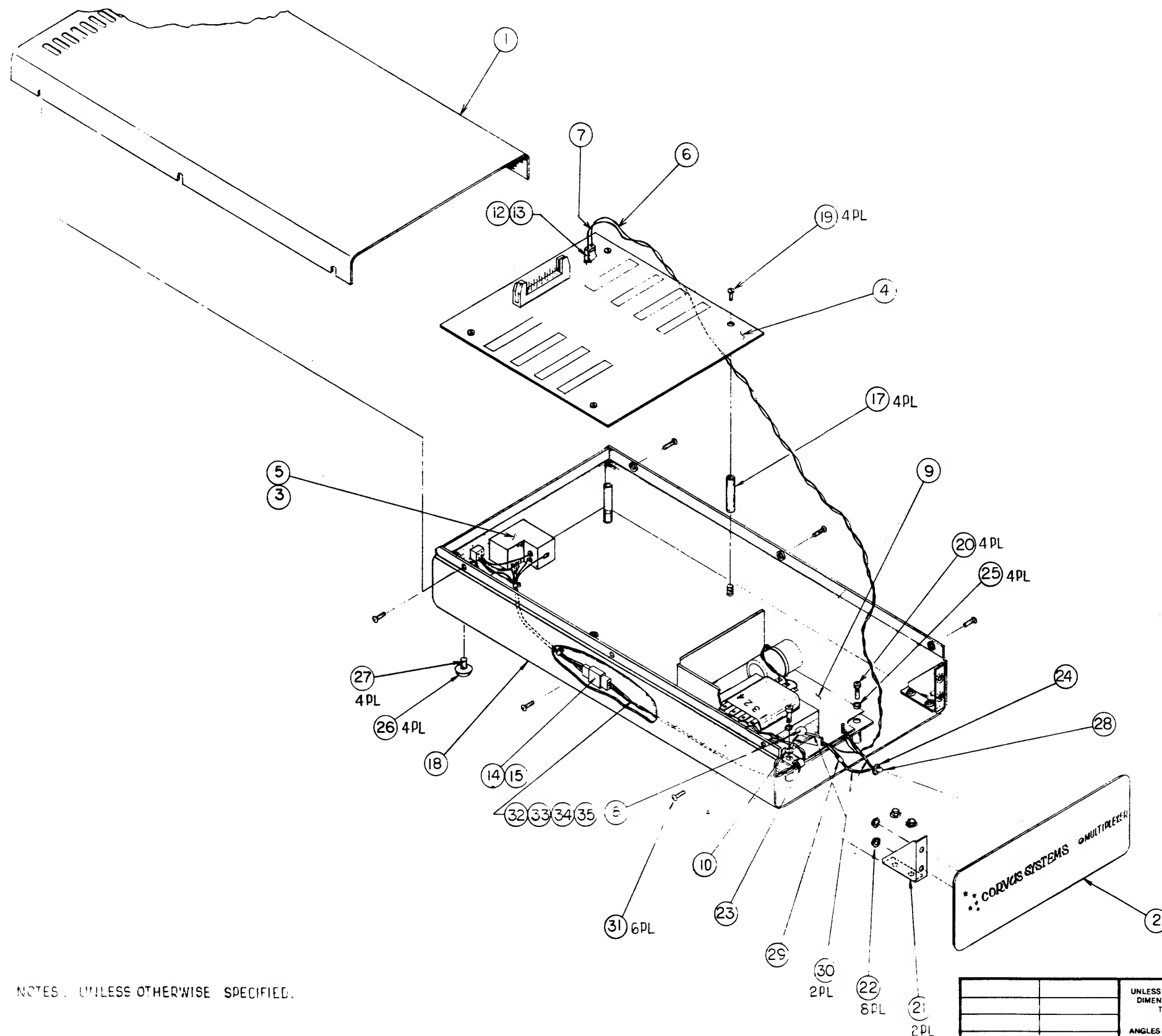
**MULTIPLEXER FINAL ASSEMBLY
METAL CABINET—8005-08094**

ID	PART NUMBER	DESCRIPTION	QTY*
1	2400-01574	COVER TOP UTILITY BOX METAL	1
2	8010-08035	FRONT PANEL MUX F/METAL UTILITY BOX	1
3	5100-01362	FUSE ½ AMP 250V	1
4	8010-08023	MULTIPLEXER PCA	1
5	8010-08069	AC POWER HARNESS	1
6	6000-02223	WIRE 18AWG BLK IRR 300V	2.290 FT
7	6000-02231	WIRE 18AWG WHT IRR 300V	1.460 FT
8	1500-01027	CAP .01 µF 1KV CEL RDL	1
9	4000-01455	POWER SUPPLY HB-5	1
10	2800-01118	LUG RING #8	1
12	2100-01065	CONN CRIMP TERM 3 POS	1
13	2800-01132	CRP TERM 18-24AWG	2
14	2100-01067	CONN PLUG 4 POS	1
15	2800-01133	CRP TERM MALE	4
17	2850-01572	STANDOFF INTERM OMNI	4
18	2400-01576	BOTTOM PAN UTILITY BOX METAL	1
19	2800-01151	SCR 4-40X5/16 PNHD SLT	4
20	2800-01186	SCR 8-32X½ ALHD	4
21	2400-01570	OMNINET BRACKET	2
22	2800-01188	KEPNUT 6-32	8
23	2800-01449	WIRE HARNESS CLIP	1
24	2800-01015	LED HOLDER	1
25	2800-01194	WASHER SPLIT #8	4
26	2800-01024	FEET RUBBER BLK	4
27	2800-01501	SCR 6-32X5/16" PNHD SLT	4
28	4820-01347	RED LED	1
29	4720-01319	RES 1K ¼W 5%	1
30	6020-01210	TEFLON SLEEVE 20AWG CLR	4 FT
31	2800-01175	SCR 6-32X5/16 BUT HD	6
32	6000-02225	WIRE 18AWG RED IRR 300V	0.790 FT
33	6000-02227	WIRE 18AWG YEL IRR 300V	0.750 FT
34	6000-02226	WIRE 18AWG ORN IRR 300V	0.730 FT

*ALL QUANTITIES ARE EACH UNLESS OTHERWISE NOTED.

REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
267	A	REL FOR PROD.	11-28-81	<i>[Signature]</i>
284	B	ADD CAP	12-15-81	<i>[Signature]</i>
063	B1	ADD ITEMS #14,15,32,33,34,35	4-15-82	<i>[Signature]</i>
064	B2	CHANGE ITEMS # 6,7	4-26-82	<i>[Signature]</i>
739	C	CHG ITEM 26 (L/M)	11-2-82	<i>[Signature]</i>

DCR
DCR



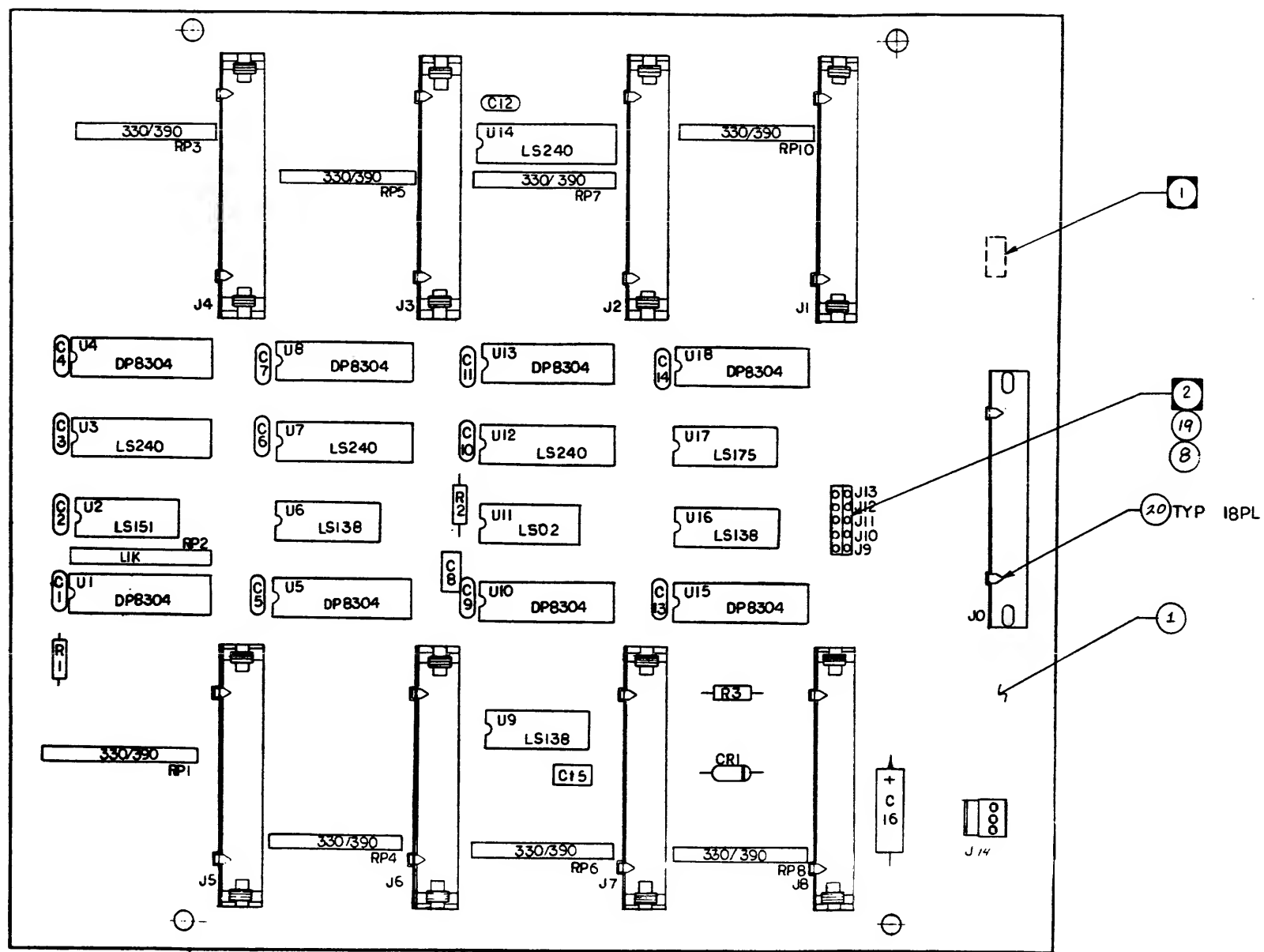
WIRE COLOR	PIN NUMBER ON CONNECTOR	TO TRANSFORMER TERMINAL NUMBER
RED	1	4
ORANGE	2	3
YELLOW	3	2
BLACK	4	1

SEE P/L

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		DRAWN BY: HUY B. DATE OF DRAWING: 10-21-81 CHECKED BY: <i>[Signature]</i> ENGINEER:		MULTIPLEXER TOP ASSEMBLY	
MATERIAL:		APPLICATION:		ASSEMBLY DWG: 8005-08394	
NEXT ASSY:		USED ON:		SCALE: 1/2	
FINISH:		APPROVAL:		SHEET 1 OF 1	

REVISIONS				
PCO	REV	DESCRIPTION	DATE	APPROVED
235	A	PROD REL	11-3-81	REL
310	B	DOC CHG ONLY	1-14-82	
713	D	ADD ITEMS TO L/M	10-12-82	
815	E	GROUND RP7 PIN10	11-20-82	GKR



3. SQUARE PAD DENOTES PIN1 OF IC, CONNECTOR, AND R-PAK.

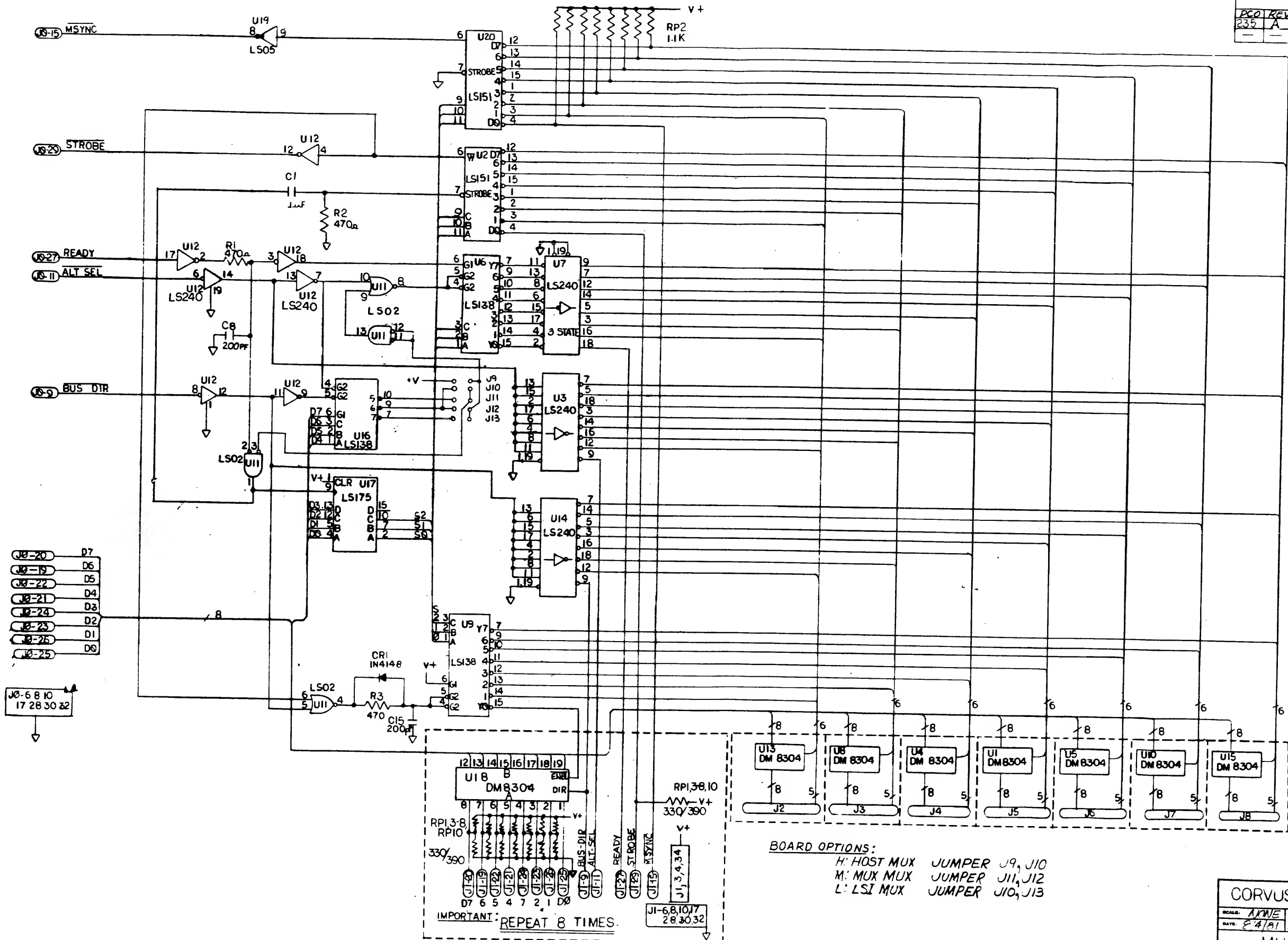
2. INSTALL PINS ITEM ON BOARD. JUMPERS ITEM WILL BE ADDED IN TEST AND AT THIS TIME THE PROPER CONFIG. SHOULD BE CIRCLED OR NOTED ON PCA.

1. PERMANENTLY MARK OR IDENTIFY REV APPROX WHERE SHOWN

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		DRAWN BY: JCM-5 DATE OF DRAWING: 7-17-81		MULTIPLEXER	
MATERIAL:		CHECKED BY:		ENGINEER:	
APPLICATION:		APPROVED:		ASSEMBLY DWG:	
NEXT ASS:		USED ON:		SCALE:	
FINISH:		APPROVED:		SHEET 1 OF 1	

REVISIONS				
PCO	REV	DESCRIPTION	APPD	DATE
235	A	PROD. REL		11/71
—	—	CORRECTION TO IC U2		3/83



BOARD OPTIONS:

H: HOST MUX JUMPER J9, J10

M: MUX MUX JUMPER J11, J12

L: LSI MUX JUMPER J10, J13

CORVUS SYSTEMS INC	
SCALE: 1X/1E	DATE: 8/4/81
MULTIPLEXER	
SCHEMATIC DIAGRAM	
1720-1801	

APPENDIX E
UTILITY SERVER HARDWARE EQUATES

APPENDIX E

UTILITY SERVER HARDWARE EQUATES

The following is a partial listing of the hardware equates that reside within the boot PROM.

MINMEM	.EQU	0	
MAXMEM	.EQU	0FF5FH	
ROMOFF	.EQU	10H	TURNES OFF BOOT ROM
CENTRONICS EQUATES			
CP_STAT	.EQU	8	STATUS PORT
CP_ACK	.EQU	20H	STROBE/ACK FF READY=1
CP_BUSY	.EQU	80H	BUSY LINE
CP_FAULT	.EQU	40H	
CP_ONLIN	.EQU	10H	
CP_PAPER	.EQU	08H	OUT OF PAPER
CP_BRDY	.EQU	0A0H	MASK FOR READY BIT
CP_RDY	.EQU	20H	VALUE WHEN READY
CP_DATA	.EQU	8	SETUP DATA FOR CENTCS
CP_STRB	.EQU	10H	PORT TO STROBE CNTRNC
CTC REGISTERS			
CTC_REG1	.EQU	0A0H	DART BAUD RATE
CTC_REG2	.EQU	0A1H	INTERRUPT BY CNTRNC PORT
CTC_REG3	.EQU	0A2H	INTERRUPT BY TRANSPORTER
CTC_REG4	.EQU	0A3H	INTERRUPT BY CLOCK CHIP
SERIAL PORT EQUATES			
SRL_FAST	.EQU	18H	USES E-CLOCK FOR SIO BAUD
SRL_SLOW	.EQU	0	USES CTC FOR SIO BAUD
CMD_REG2	.EQU	63H	
ST_REG2	.EQU	63H	
DTA_REG2	.EQU	62H	
CMD_REG1	.EQU	61H	
ST_REG1	.EQU	61H	
DTA_REG1	.EQU	60H	
DART STATUS REG BIT EQUATES			
TX_BFE	.EQU	4	
RX_BFF	.EQU	1	
6883 CONTROL ADDRESSES			
MFAST	.EQU	0FFD9H	FAST MODE
MSLOW	.EQU	0FFD8H	SET 6883 TO SLOW MODE
M64KA	.EQU	0FFDAH	
M64KB	.EQU	0FFDDH	SET 6883 to 64K DRAM
MROM	.EQU	0FFDEH	SET 6883 TO RAM-ROM MAP
MRAM	.EQU	0FFDFH	SET 6883 TO ALL-RAM MAP
OMNINET EQUATES			
O_STATUS	.EQU	8	XPORTER STATUS ADDR
O_STROBE	.EQU	0	XPORTER STROBE ADDR
B_OMNLRDY	.EQU	4	MASK FOR RDY STATUS
OMNLRDY	.EQU	4	VALUE WHEN READY
TEST BUS EQUATES			
TBDATA	.EQU	10H	READ & STROBE TEST BUS